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STONES IN THE COMMON DUCT AND THEIR SURGICAL TREATMENT,

WITH REMARKS ON THE BALL-VALVE ACTION OF FLOATING CHOLEDOCHUS-STONES.[1]

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Gall-stones in the common duct were found by Fiedler in only 2 out of 800 autopsies (Courvoisier). Schloth in 343 cases of cholelithiasis found stones in the common duct 9 times, that is, in 2.6 per cent. of the cases. Courvoisier found stones in the common duct in 10 out of 255 cases of cholelithiasis, or in 3.9 per cent. of the cases. Conradi found gall-stones in 2.6 per cent. of dead bodies; namely, 1.6 per cent. in men and 3.6 per cent. in women. In 97 cases of cholelithiasis he found stone in the gall-bladder alone in 82 cases, in the gall-bladder and common duct in 10 cases, and in the common duct alone in 5 cases; that is, he found stones in the common duct in nearly 15 per cent. of the cases of cholelithiasis.

As gall-stones, when located in the common duct, almost always give rise to serious disturbances, obstruction to the flow of bile and its consequences, while, when located in the gall-bladder or cystic duct, they cause little or no disturbance as long as no infection or inflammation occurs, it is obvious that although the cases of choledochus-stone are in the minority, varying from 2.6 per cent. to 15 per cent., this minority

[1] Read before the American Medical Association, 1895.

will make itself felt partly from the gravity of the symptoms caused, and partly from the dignity of the operation demanded for relief.

Operation for stone in the common duct is of comparatively recent origin. A number of different operative procedures have been employed, and are yet under discussion. The symptoms of stone in the common duct, in contradistinction to those of stone in the gall-bladder and cystic duct, have not hitherto been sufficiently differentiated. The surgical anatomy and pathology of the common duct and its surroundings have received little attention, as this region of the body has become a field of operation only within the last five years. I have had the opportunity of observing six cases of stone in the common duct during the past year, in five of which I operated, and in two obtained an autopsy. The material thus obtained I have used as a basis for the study of stones in the common duct, with especial reference to some points in the anatomy, symptoms, and operative treatment, which have either not been mentioned at all, or have received only slight attention in the brilliant and exhaustive monograph of Courvoisier. To this author we owe not only this monument in the pathology and surgery of the bile-ducts, but also choledochotomy, or, as he calls it, choledocholithotomy, the operation of choice for stones in the common duct.

I will first report the six cases in detail. When attempting to think over the plan of operation to be performed in a difficult or uncertain case, I have often derived great help from reading the reports in detail of similar cases. The greater the detail, the more valuable were they to me. The too common method of presenting a merely cursory report of a large number of cases is entirely valueless in this regard. For this reason I present in detail the reports of the following cases. The first case, in which no operation was performed, but in which an autopsy was made, furnished the material for the study of the pathological anatomy and the mechanism of ball-valve action in choledochus-stone. In order to avoid repetition, the most essential points in relation to these two subjects have been embodied in the report of the autopsy in this case and in the remarks thereon. The remainder of the cases furnished the material for symptomatology and treatment.

CASE I. *Synopsis: Two years ago first attack of colic with icterus. Attacks more and more frequent with slight remittent icterus. Remittent pain every two or three days for three weeks, followed by fever, icterus gravis, and death. Autopsy revealed one small floating stone in the dilated common duct.*

Mrs. G. E., aged thirty-one years, was admitted to the German Hospital in the service of Dr. Hessert, March 29, 1895. The mother of the patient died at the age of forty-two years from a trouble similar to that for which the patient entered the hospital. Nothing further of the family history of the patient could be ascertained.

As a child the patient was weakly; at the age of twelve years she

began to menstruate; menstruation has always been regular and without pain. At about the age of eighteen years she began to have vomiting attacks at intervals of five or six weeks or less, especially after eating indigestible food. The vomitus consisted first of food and later on of brownish slime. The emetic efforts were exceedingly violent, as though "she could vomit up the abdominal viscera."

The patient always appeared healthy except after one of these attacks of vomiting, when she would lose in weight, but would afterward regain health and flesh rapidly. The attacks lasted one or two days, during which time she would vomit for perhaps five minutes at intervals of an hour. The vomitus was usually a brownish fluid. Each year there has been a slight increase of the symptoms, and the vomiting has been more severe and frequent.

In 1883 the patient married. She has had seven children. Three or four days before her last confinement she had a very severe attack of vomiting, with intense pain in the lower part of the back and abdomen. Shortly after her confinement she had another attack of vomiting accompanied by intense pain in the epigastric region. A few hours after this attack began, the skin and the sclerotics were noticed for the first time to be icteric. This attack lasted for fourteen days, during which time the patient rapidly lost weight, losing altogether about sixty pounds. The attacks of vomiting finally recurred every two weeks. The pain in the abdomen, epigastric region, and back became constant, but the pain over the region of the gall-bladder occurred only every two or three days. On the day following each attack the skin was of a darker, icteric hue.

In February, 1895, the patient undertook the water-cure, which resulted in slight temporary improvement of her condition. About March 1st she was suddenly seized with severe pain in the "inguinal region" and lower lumbar region, accompanied by vomiting. The patient felt during this attack as if something had given way, whereupon the severe inguinal pain immediately ceased, but the pain in the back continued for several hours. Two days later she had another attack of pain which lasted for three weeks, with exacerbations of pain every two or three days in both hypochondriac regions. After the 17th of March the patient felt better, but every afternoon about 4 o'clock she was seized with a chill and fever. Upon March 24th, severe general headache began, which became constantly worse, until she lay in a stupor. Her condition became more grave, the stupor more profound, and she died on April 5th. For three days before she died there was no vomiting. The stools were very dark, greenish-brown, and without foul smell, but had a very peculiar mouldy odor. The patient had exceedingly severe and almost constant pain located over the left lobe and median line of the liver. The bowels moved twice during the three days before she died, and the urine was drawn off by catheter.

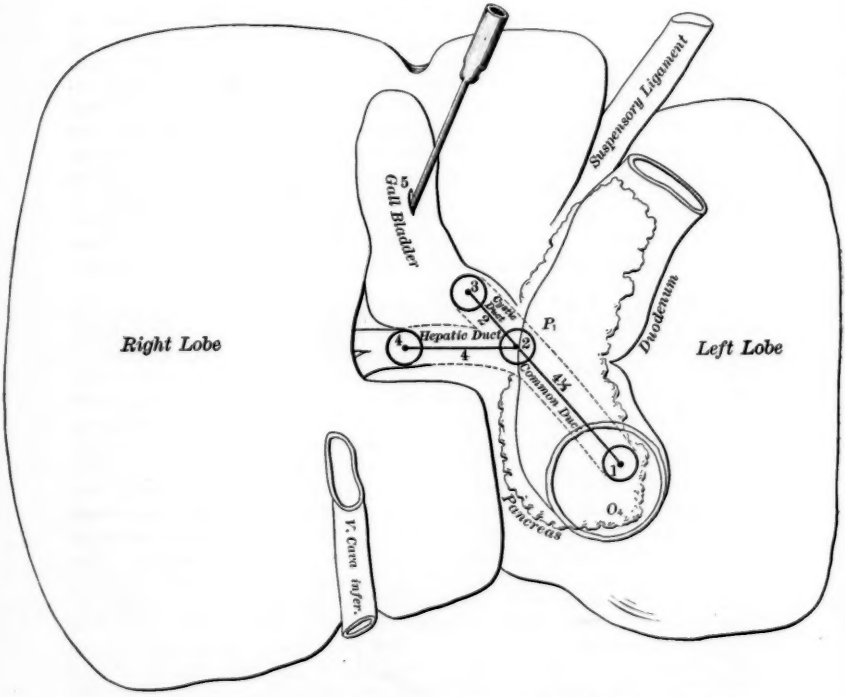
Autopsy by Dr. Haiselden. The subject was emaciated, the skin dark and presented a somewhat bronzed appearance. The thoracic viscera were normal, with the exception of old adhesions in the apex of the right lung. The abdominal viscera were normal with the exception of the kidneys, which contained small hemorrhagic infarcts, and the left ovary, which was small and atrophic, and contained a cyst the size of a butternut, filled with clear serous fluid. The brain on section showed a large quantity of fluid in the ventricles. The liver, gall-bladder, pan-

creas, and duodenum which was ligated above and below the pancreas, were removed entire.

The liver was flabby and a dirty brown in color. Upon cross-section the surface was a dirty brownish-yellow; the tissue was soft and friable, so that the finger could be easily pushed into it (acute yellow atrophy).

The gall-bladder was empty, atrophied, and small, so that it did not extend to the incisura hepatis. When a glass tube was inserted into the gall-bladder and the latter inflated with air, the air filled first the gall-bladder, then passed down into the cystic duct, then into the common duct, and then entered and distended the duodenum. No stones could be felt in the gall-bladder or in the cystic duct.

FIG. 1.



In the common duct a small round stone, 1 centimetre in diameter was felt; it was movable—that is, it could be pushed or dislodged with the finger from the duodenal end of the common duct into the hepatic duct. It could be pushed up into the hilus at "4" (Fig. 1); was more superficially located at "2" at the border of the duodenum; from this point it passed downward behind the duodenum to "1." The horizontal portion of the canal was 4 to 4½ centimetres long, and the oblique portion 4½ to 5 centimetres long. The lower portion of the duct was

surrounded by pancreas-tissue, and the stone was stopped at the lower end of the head of the pancreas on the middle of the posterior surface of the duodenum.

REMARKS. The cause of death was cholæmia or icterus gravis. The opening from the common duct into the duodenum was not completely closed, as air could be inflated, and as the duodenum contained greenish fluid feces. The cystic duct was open to air-inflation, and the gall-bladder contained a dirty green fluid, together with yellowish-green gravel.

The stone acted as a "ball-valve," and caused icterus, when it lay close to the opening of the common duct into the duodenum, by stopping the passage of bile into the duodenum. The stone was freely movable in the common and hepatic ducts. The stone was not grasped tightly by the common duct, as Courvoisier states. The wall of the common and hepatic ducts was not thickened, but the ducts were considerably dilated. There was neither pus nor inflammation in or around the duct, nor cholangitis. The stone was probably the cause of the emptiness and atrophy of the gall-bladder and of the cystic duct.

That the small gall-stone, 1 centimetre in diameter, freely movable, floating or swimming in the ductus choledochus, cystic and hepatic ducts might have caused complete stoppage of the flow of bile by acting like the ball in a ball-valve was proved by the following experiment:

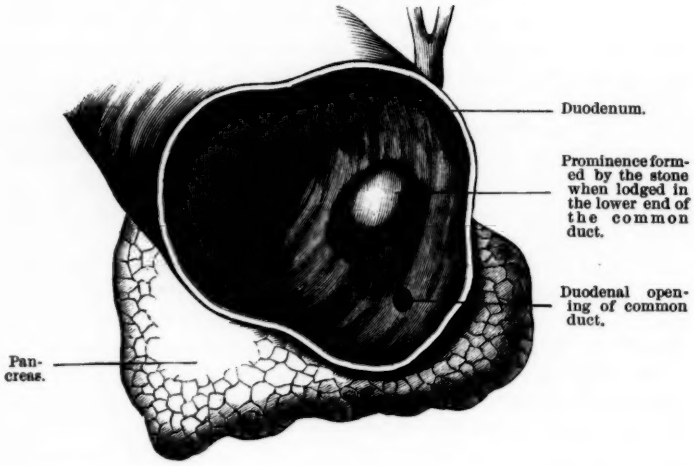
The duodenum was opened opposite the diverticulum of Vater, and the papilla, on which the opening from the duodenum into the diverticulum was found, was seen to be of normal size and shape, and the duodenal mucosa and wall in normal condition. A silver probe passed readily from the duodenum into the common duct, and when it was pushed down toward the end of the common duct grated against the stone. A silver probe passed down from the gall-bladder into the common duct passed easily through the latter into the duodenum. It is comparatively easy to pass a probe through a dilated common duct, but it is not until search has been made by pushing and sliding the mucous membrane of the duodenum that the exit of the duct is found; because the dilated duct, just above the canal through the wall of the duodenum, forms a pouch or pocket in which the probe is caught until the narrow exit is found. There was no stenosis of the duodenal opening of the common duct, but the common, cystic, and hepatic ducts were all dilated.

A canula was now inserted in the gall-bladder (see Fig. 1), through which glycerin, which has about the same consistency as bile, was injected until first the gall-bladder, then the cystic, then the common, and finally the hepatic duct were filled and distended.

When the stone was now placed in any of the ducts or in any place with the exception of the lower end of the common duct, the glycerin would flow out in a continuous stream through the opening into the duodenum.

When the stone was made to slide down as far as it would pass into the common duct, namely, into the cul-de-sac or pouch just above the duodenal opening (Fig. 2), the flow of glycerin into the duodenum ceased, and a further injection through the canula into the gall-bladder made the duct and the gall-bladder more tense and full, but not a drop of the glycerin entered the duodenum.

FIG. 2.


Duodenum.
Prominence formed by the stone when lodged in the lower end of the common duct.
Duodenal opening of common duct.
Pancreas.

When I now dislodged the stone a little, pushing it up out of the pouch by pressing slightly on the prominence which it formed in the duodenum, ½ cm. above the opening, the glycerin immediately began to flow into the duodenum. This flow would continue until I again pushed the stone back into its former position. I repeated this experiment a number of times, and always with the same result, namely, that the flow of glycerin would cease entirely as soon as the stone came down into the cul-de-sac immediately behind the opening of the duct into the duodenum. I therefore considered that the "ball-valve" mechanism as effected by the small round stone in the pouch at the lower end of the common duct, behind the normal duodenal end, was the sole cause of the stoppage of the flow of bile, of the retention of bile, and of the icterus.

Exact measurements of the distances which the stone could be moved in the respective ducts gave the following results, as shown in Fig. 1:

(*a*) *Common Duct.* From the cul-de-sac, the lowest point to which the stone could be forced, up to the junction of the hepatic and cystic ducts, was 4.5 cm.

(*b*) *Cystic Duct.* The lower part of cystic duct was 2 cm. long; that

is, the stone could be pushed up into the duct to this distance. Its direction was in a line with the common duct, an oblique line directed from above anteriorly, and the right, downward, backward, and to the left, forming an angle of 45° with the horizontal and vertical lines, respectively.

(*c*) *Hepatic Duct.* The stone could be moved in the hepatic duct a distance of 4 cm. in an almost horizontal direction from left to right (see Fig. 1). When the stone was lodged in the right end of the duct, or was pushed or made to slide as far to the right as possible, it disappeared from the surface down into the liver, so that only its upper or anterior surface could be felt, and even this was attended with considerable difficulty. The point at which it descended into the liver was 1 cm. to the left of the medial or left border of the right lobe (in the horizontal branch of the "H" in the hilus, 1 cm. from its right end). The hepatic duct, having a horizontal direction, thus formed an angle of about 45° with the cystic duct, and an angle of about 135° with the common duct.

The passage of bile back into the cystic duct and the gall-bladder was free when the entire system of gall-bladder and ducts was filled with glycerin, and when the stone was free in the middle of the common duct.

The ball-valve action of the stone in the cystic duct, whereby the filling of the gall-bladder with bile was prevented, was demonstrated in the following manner:—

The gall-bladder was opened at "5," Fig. 1. The stone was made to slide up into the cystic duct until it lodged at "3." Glycerin mixed with white lead, so as to look milky white, was injected through a canula inserted from the duodenum, through the duodenal opening, into the common duct for a distance of 1 to 1½ inches. The common and hepatic ducts filled slowly until the place of lodgment of the stone in the cystic duct was reached, but here the fluid was stopped and did not pass up into the gall-bladder. When the stone was made to slide down into the common duct, the fluid flowed up into and out of the gall-bladder at "5." This experiment was repeated several times with identical results; the stone acted as does the ball in the ball-valve, and prevented the passage of the fluid into the gall-bladder.

During this experiment, while the common duct was distended with the fluid, the hepatic duct also became distended, and the glycerin-emulsion escaped from the cut surface of the right lobe, from the right border of which pieces had been removed for microscopic examination. This escape of the fluid from the distal branches of the bile-ducts of the liver proved that the larger hepatic ducts and the smaller bile-duct were permeable. The prevention of regurgitation of bile from the common duct into the gall-bladder by ball-valve action of the stone in

or near the cystic duct explains why the gall-bladder is found small and empty in cases of movable stone in the common duct. When the stone has been lodged in the cystic duct at "3," and the gall-bladder has been empty for a considerable time, possibly for months, the latter naturally retracts and loses its power of distention, its elasticity, so that it cannot be filled to its normal capacity, even if the passage becomes free later on by occasional dislodgment of the stone.

It is impossible to demonstrate the ball-valve action of a choledochus-stone on animals or even in normal biliary passages. The proof of this action requires a system of biliary passages altered by the presence of a cholodochus-stone in the manner here described. The experiment undertaken with this specimen proved conclusively, and to the satisfaction and conviction of those present, the ball-valve action described above.

The bearing of the effect of this ball-valve action on the symptoms and course of cases of choledochus-stone is obvious. Its action is dual:—

(*a*) It causes intermittent attacks of retention of bile and icterus when the stone is lodged immediately above the duodenal opening of the common duct.

(*b*) It causes atrophy and shrinkage of the gall-bladder when the stone is lodged in or immediately below the cystic duct.

The ease with which a comparatively small stone is dislodged and floats around in the dilated canal; namely, the common, cystic, and hepatic ducts, is remarkable; it requires only a very slight touch with the finger or sound outside of the duct to push the stone from one place to another. As the stone has about the same specific gravity as the bile, it moves upon the slightest contraction of the wall, or when currents of bile act upon its surface. Thus, movements of the body which cause movements of the liver, duodenum, or transverse colon may cause movements of the stone from one place to another.

The specific gravity of the human bile is 1.030. Although the choledochus-stones, as, for instance, in three of my cases, float in the bile, they sink in water. The specific gravity of gall-stones thus lies between 1.000 and 1.030.

The direction of the large bile-ducts is almost horizontal when the body is erect. If the specific gravity of the stone plays any part in causing its dislodgment, it might be possible to dislodge it from its position behind the duodenal opening of the common duct, where it causes biliary colic and icterus. I therefore think it might be well to place the patient suffering from this condition, for a time but not constantly, on the right side, or on the stomach.

Ball-valve action was observed by Courvoisier in the cystic duct in two cases of his own, and in one case of Socin's during operation for gall-stone, but neither Courvoisier nor any other author has, to my knowledge, observed this phenomenon in the common duct.

Courvoisier describes his observation as follows (*loc. cit.*, page 18): "A peculiarly strange condition is the following : The more or less round, spherical stone is situated in a dilated portion of the cystic duct in such a manner that it is not immovably grasped by the wall of the duct, but so that it can be moved or moves only a short distance in a proximal and distal direction. If we now make pressure on the fundus of the gall-bladder, its contents will press the stone firmly down into the duct, causing it to close the duct hermetically like a ball-valve, so that not a drop can pass out. The bile, however, from the hepatic duct (Why not from the common duct?—F.) can yet enter the gall-bladder as long as no great tension exists here. This peculiar condition, which plays a part in the genesis of certain ectasias of the gall-bladder, I have myself observed in two cases during cholecystectomy and also in an analogous case of Socin's."

Neither Courvoisier nor any other author seems to have observed the ball-valve action of floating stones in the common duct. While this condition in the cystic duct is comparatively rare, and is of little practical importance, as it could cause dilatation of the gall-bladder only, I have reason to believe that the floating stone with ball-valve action is the condition ordinarily found in the common duct, and is of great practical importance, as it explains the causation of the remittent icterus and of the multiple slight attacks of icterus and colic. It has also a scientific importance, as it explains the atrophy of the gall-bladder, which takes place in the way I have described above.

CASE II. *First attack of biliary colic two years ago followed by icterus; second attack, October,* 1894, *followed by frequent lighter attacks; loss of weight, 15 pounds in ten weeks; slight icterus; no tumor of gall-bladder; operation; adhesions to atrophic gall-bladder; choledochotomy; one stone, 2 cm. in diameter, removed; no leakage of bile; recovery; gained 50 pounds in three months.*

Mrs. C. L., married, aged forty-two years, was admitted to the German Hospital, January 3, 1895. Family history good; patient began to menstruate when sixteen years of age; has always been regular; flow has been excessive and each period accompanied by backache and nausea; no leucorrhœa, no pain on urination. She was married when twenty years of age, has six living children, and has had two miscarriages, both of which occurred after the birth of the third child and within one year of each other.

Twenty-two years ago the patient began to have pain in the epigastric region after eating food difficult of digestion, or after drinking cold water. For the ten years following she was obliged to be very careful in eating.

The present illness began in 1892, when a sudden attack of intense pain over the lower ribs on the right side and in the stomach occurred. The pain persisted for twenty-four hours and then subsided, only to return with greater severity. These attacks occurred at frequent intervals for three weeks, during which time the patient was confined to her

bed. Her physician, Dr. Illingworth, attributed the attacks to gall-stones and noticed that the patient was somewhat icteric. Since this time the patient has never felt entirely well; she frequently feels weak, and has severe backache and heaviness in the epigastric region, more marked after eating.

The next severe attack occurred October 8, 1894, when the patient had vertigo and pain in the right side, which gradually became more severe and was accompanied by vomiting. The pain began in the region of the gall-bladder, and soon extended to the epigastrium.

The bowels moved regularly, but the movements were grayish-black. Since that time the stools have been grayish and foul-smelling. Since the beginning of this attack the patient has had frequent recurrences of the pain, which would always begin on the right side over the lower costal cartilages, and would soon radiate to the stomach. The attack lasted ordinarily from noon until 10 P.M., and was relieved by morphine. Her sleep has been much disturbed since the attack.

The patient did not notice any icterus until after the pain had commenced, when the skin became "as yellow as wax." There was also an intolerable itching of the skin. After this attack the patient remained in bed for about five weeks. For the two weeks following she had constant pain in the right hypochondriac region and stomach. On January 1, 1895, pain commenced in the back, and the patient felt chilly. A few hours later she had very severe shooting pains in the right side and stomach, and these attacks recurred at frequent intervals for three days. On the fourth day she felt somewhat better, and was up and around, and the next day she entered the hospital, since which time she has had no pain.

The patient has a fair appetite when not in pain, the tongue is not usually coated, but at this time was slightly furred. She states she has lost fifteen pounds in weight since October 15, 1894. Examination of urine showed no abnormality.

Upon examination the patient was found to be rather poorly nourished, the icterus was disappearing, but a slight trace of yellow remained in the conjunctiva. Upon percussion the liver was found to be of normal dimensions. On palpation the liver was felt below the border of the ribs for about one and one-half or two inches, but the border was not distinct. There was some tenderness upon pressure in the region of the gall-bladder, but no tumor nor hardness could be felt in this place. The urine was apparently normal; the last two stools were yellow from bile-coloring.

The patient was prepared for operation in the usual manner and anæsthetized with ether. Upon palpation in narcosis I thought I could feel a rounded resistance in the region of the gall-bladder. With the assistance of Drs. Bernauer, Brown, and Haiselden, and in the presence of Drs. Illingworth, Hecht, and Goldspohn, I operated on January 5, 1895, in the following manner:—

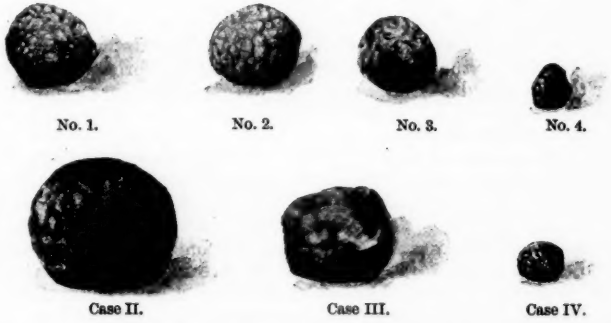
A lateral longitudinal incision was made 10 cm. in length along the outer border of the right rectus muscle through the parietal peritoneum, whereupon I felt a rounded tumor which I thought to be the gall-bladder, but which proved to be the obtuse, rounded border of the quadrate lobe. The anterior border of the liver was rounded and not sharp. The liver was bluish, smooth, and on the upper surface of the convex right lobe there was a whitish, rounded spot 3 mm. in diameter, not prominent

upon the surface, and not hard. The incisuræ between the anterior and right lobes, and between the left and anterior lobes were marked. In the grooves between the quadrate lobe and the right lobe—that is, the groove for the gall-bladder, no gall-bladder could be seen or felt, but the groove was filled with adhesions to the transverse colon.

By blunt separation and division between ligatures I now loosened the transverse colon, but still the gall-bladder did not come into view. The pyloric portion of the stomach was found to be adherent to the lower surface of the liver, and the liver was held up toward the ribs by the second and third fingers of an assistant.

Large, flat sponges were now packed in the abdomen around the field of operation and the wound was held open by retractors. Upon loosening the adhesions of the pyloric portion of the stomach I found a small, empty gall-bladder 4 cm. long and 1 cm. broad, whitish, extending from below the border of the liver 4 to 5 cm. backward to the hilus. The duodenum was pulled upward and to the left away from the lower surface of the atrophied gall-bladder. Blunt dissection with the fingers and Kocher's sound finally permitted me to feel partly through the duodenum, and partly behind it, a nodular mass in the hilus of the liver, consisting of soft, almost immovable glands, and a hard, rounded, movable mass, which was a large gall-stone, and a little nearer to the median line, another semisolid mass, which was the head of the pancreas. As I was uncertain whether the whole mass was carcinoma or gall-stone, and in order to gain further operating space, the abdominal wound was

FIG. 3.



prolonged downward and below the umbilicus, making an incision in all 12 to 15 cm. in length. The colon and omentum were now held down, the stomach held to the right, the liver pushed up, and the duodenum separated from the gall-bladder so that I could get a finger in behind the nodular mass. With the index and third fingers I could now push the mass out into the field of operation. I could not distinguish the hepatic artery, vena porta, or common duct, but I could see large swollen glands the size of almonds. I now explored for the stone with a straight needle, the mass being held forward by my left third finger in the foramen of Winslow, and the stone held firmly in position against the wall of the common duct, whereupon the needle pushed against it gave forth a grating sound.

A longitudinal incision 2 cm. long was now made at the left border of the mass through the loose layer of the hepatico-duodenal ligament, the soft mass of glands and the whitish wall of the common duct, which was 2 mm. thick, to the surface of the stone. The stone, which was rounded, 2 cm. in diameter, finely nodular, and weighed 5 grammes (see Fig. 3), was removed, and my finger then passed readily into the common duct, which had formed a pouch for the stone large enough to admit the finger. One or two drachms of clear yellow bile escaped.

After thorough sponging the ductus choledochus was explored by a curved metal sound, which passed easily upward for 10 to 12 cm., but detected no other stones. I did not, however, succeed in passing the probe into the duodenum through the ductus choledochus, either downward or toward the median line. The wall of the ductus choledochus was thickened from hypertrophy of the muscularis, grayish-red, but not hard or friable. There was no carcinoma. The inner wall of the surface of the dilated ductus choledochus, where the stone was located, was whitish-red, the mucosa normal; neither carcinoma nor ulcer was found. The hilus glands, surrounding the ducts, were enlarged, soft, and reddish from inflammatory swelling.

As bile had already passed down into the bowel, as was seen from the bilary coloring of the last two stools, I desisted from further search for an opening into the duodenum, and proceeded to close the wound in the bile-duct by a double row of extra-mucous silk sutures, as follows:—

First, five sutures through the muscularis of the duct; second, five sutures through the glands and tissues of the hepatico-duodenal ligament. This second series of sutures covered the deeper row. No bile escaped after the first row of sutures had been inserted. I now proceeded to close the field of operation. The bleeding points in the duodenum and elsewhere were first ligated and a Mikulicz drain applied. A glass tube was inserted to the bottom of the wound, and iodoform-gauze packed in over the sutured duct. The upper half of the abdominal wound over the ribs and the liver was united by step sutures; first, separate buried peritoneal sutures, and, second, cutaneous silk sutures, which included the skin, muscles, and sheath of the rectus. The lower border or end of the wound was united by three transperitoneal sutures. The middle of the wound was left open on account of the gauze and glass drain and the usual dressing applied. The operation lasted two and one-half hours.

Five hours after the operation the glass drain contained about ½ drachm of bloody fluid, which was removed with the dressing and a rubber tube inserted in its place. The gauze drain was not disturbed. On *January* 10*th* the patient had a slight hemorrhage from the mouth and nose; the blood was bright red and was not preceded by cough. 13*th*. Dressing changed, considerable serous discharge somewhat tinged with blood. Faint odor to be detected in the wound. Very little tenderness on pressure except over gauze drain, and some soreness along the stitches in the upper part of the wound. 15*th*. Rubber tube and part of the gauze drain removed. 16*th*. Wound redressed and more gauze removed from the abdomen. 17*th*. More gauze removed and also two stitches. 20*th*. Wound dressed and repacked, stitches removed. *February* 3*d*. The granulations forced out the packing from the wound. The wound was closed until only a sinus about the diameter of the little finger remained. Patient complained of moderate, constant pain on the right side under the lower ribs upon deep inspiration. 9*th*. The sinus now is about two inches in

depth, but is very narrow with very little discharge. *March 10th.* The sinus entirely closed. *April 10th.* The patient has gained about 50 pounds in weight, looks very strong, and says she feels entirely well.

REMARKS. *Hemorrhagic Diathesis.* Hemorrhage from the nose and mouth occurred on January 10th, five days after the operation, and on the eighth day the dressings were tinged with blood. The hemorrhagic diathesis is well known in icterus gravis and is also found in the icterus from gall-stone. It is a grave complication, and Courvoisier found 58 cases, in most of which operation was not performed, and in which the hemorrhage was severe and often fatal. He collected six cases in which hemorrhage from the wound of operation in the gall-bladder had a fatal termination. He warns us to search the history of the patient and make careful examination all over the body in order to ascertain whether or not a predisposition to hemorrhage exists, either from the mucous membranes or in the subcutaneous tissues; and in case the patient presents this symptom to abstain from operation, which is likely to prove fatal on account of the uncontrollable hemorrhage from the wound of operation or from other organs.

In some cases, however, in which no symptoms of hemorrhage preexisted, the operation has been followed by fatal hemorrhage, not from the operation-wound, but from other portions of the body. It seems almost as if the operation brings into active existence a latent hemorrhagic condition. Mermann reports that Czerny lost 7 patients out of 43 upon whom he operated for diseases of the biliary tracts. Three of the seven deaths were caused by cholæmic secondary hemorrhage, which in one case occurred from the intestine, entirely independent of the wound of operation.

CASE III. *First attack of biliary colic five years ago; after third attack frequent slighter attacks of pain and icterus for four months; one year ago, fourth attack with icterus, followed by frequent slighter attacks at intervals of ten days; five months later, cholecystotomy, with no relief; loss of weight, 50 pounds; slight icterus; mucous gall-bladder fistula; choledochotomy; removal of one stone, one and one-half centimetres in diameter; no leakage of bile; recovery; gained 20 pounds in three months.*

Mrs. R., aged forty years, was admitted to the German Hospital February 10, 1895. Family history good; patient began menstruating at twelve years, always regular, no pain, moderate flow. At age of twenty years had an attack of acute gastro-enteritis with vomiting and diarrhœa, but without pain or icterus. She married at twenty-three years, and has had five children and one miscarriage, the latter probably due to a concurrent attack of measles.

Her present illness began suddenly about five years ago with cramps in the stomach, accompanied by constipation, and vomiting of green, slimy matter. The pain in the stomach lasted about two hours and did not recur for about six months, when a second attack occurred, lasting two to three hours. Since that time she has had similar attacks at irregular intervals. Until 1892 there was no icterus. At this time the

patient had attacks of pain in the region of the stomach and gall-bladder occurring at very frequent intervals and sometimes lasting all night. Icterus was present, which persisted for about four months, but afterward disappeared.

In the winter of 1893 the patient, who had been ill in the interim, had another attack, not so severe as the former ones and without icterus, but the stools were gray. The patient was confined to her bed for about a week and then felt better, until April, 1894, when the attacks again recurred every three or four days, with pain in the region of the stomach and gall-bladder, but most severe in the lower dorsal region. About two days after each attack the urine was brown, the icterus intense, and the stools gray. The icterus varied in intensity with the severity of the pain. After a few weeks the attacks occurred only every ten days, but continued during the entire summer. In September, 1894, Dr. Wiener operated, making a right lateral incision, and removed one stone about the size of a hazelnut from the gall-bladder. Patient remained in bed for five weeks after the operation. She obtained no relief from the operation, and all the symptoms returned.

Present condition. Patient was anæmic, rather poorly nourished; had lost about fifty pounds in weight in the last five months. The skin and sclerotics were slightly icteric, stools clay-colored, heart and lungs negative; pressure over the lower border of the liver and the median line caused considerable local pain and also pain in the back.

There was a longitudinal cicatrix 7 cm. long along the border of the rectus muscle over the gall-bladder, and a small fistulous opening from which a clear, viscid mucus exuded, a few drops at a time, which, upon examination, was shown to contain pus-corpuscles.

On February 21st, I operated with the assistance of Drs. Bernauer, Brown, Haiselden, and Gottschalk, in the presence of physicians from the Polyclinic. Ether was the anæsthetic. The fistula, which was 5 cm. in depth, was scraped and closed with a silk continuous pouch-suture. An incision was made around the fistulous opening 1 cm. therefrom. The incision was then carried up above the border of the ribs and down through the old cicatrix. The peritoneal cavity was opened 5 cm. below the fistula, and, guided by the finger in the abdomen, the fistula was excised and left connected with the gall-bladder. The right lobe was an elongated corset-lobe. The transverse colon and pylorus were adherent to the gall-bladder and hilus. These adhesions were broken up, and palpation showed the gall-bladder to be contracted and empty, containing no stone, nor could a stone be felt below the gall-bladder in the cystic duct. The adhesions were now loosened from the anterior surface of the hepatico-duodenal ligament, and its free right border, the entrance to the foramen of Winslow, isolated so that the index-finger of the left hand could pass into the foramen along the posterior surface of the hepatico-duodenal ligament. Upon palpating the ligament of the liver down to the duodenum I could feel a movable rounded stone the size of a hazelnut, which would slip away from my fingers up to and into the hilus of the liver. By passing the finger high up on the posterior surface of the hepatico-duodenal ligament I could feel the stone in the hilus and could move it down, forward, and to the median line as far as the border of the duodenum and even a little behind its right border. The stone could move in the dilated ductus choledochus for 6 or 8 cm. I could fix the stone

between the index-finger on the posterior surface of the hepatico-duodenal ligament and the thumb on its anterior surface, and push the stone against the wall of the ductus choledochus at the right free border of the hepatico-duodenal ligament. Upon pressing the stone against the wall of the duct in this place I could see the enlarged white stone shining through the dark-red peritoneal covering of the ligament. I could feel the hepatic artery across the median line about 2 cm. from the free border of the ligament, and to the right of the hepatic artery I could see a bluish band running longitudinally in the ligament from the hilus of the liver to the left of the duodenum; this was probably a branch of the vena porta.

The abdomen was packed with large, flat sponges, one between the right lobe of the liver and the diaphragm, one over the pylorus and stomach, and one over the upper surface of the transverse colon and omentum.

Fixing the stone against the anterior surface of the hepatico-duodenal ligament close to the duodenum, 1 cm. from the entrance to the foramen of Winslow, I made a longitudinal incision 1 to 2 cm. long down to the surface of the stone (see Fig. 5), which was then lifted out with a sharp spoon, as I wished to avoid crushing the stone; a moderate flow of light-yellow, transparent bile followed.

An assistant now held the liver up against the diaphragm with both hands, one on the right lobe and the gall-bladder, and the other on the left lobe. This hand also pushed the stomach upward and to the left. Another assistant with two fingers of the hand held down the transverse colon. Thus I obtained space for suturing the longitudinal wound in the duct. The duct was now explored by probe, elastic bougie, and finger. The probe and elastic bougie passed up 8 or 10 cm. into the hilus of the liver, and down 4 or 5 cm. behind, but not into the duodenum. The dilated duct easily admitted my little, third, or index-finger to a distance of 5 cm. upward into the hilus, where no stone could be felt, and 4 cm. downward behind the duodenum into a pocket which ended blindly like the finger of a glove.

The wound in the ductus choledochus was closed by, first, a row of six mucosa sutures (the ends of which were left long) through the muscularis and mucosa, which was smooth and pale yellow from bile, and, second, an outer row of Lembert serosa sutures ½ cm. from the first row, taking in 2 to 4 mm. of the serosa. After six of these sutures had been inserted there was a flow of bile from the lower corner of the wound. The ends of the inner row of sutures were cut short and four additional Lembert sutures applied, after which the flow of bile ceased, and I considered the canal hermetically closed.

The skin and abdominal wall over the fistula into the gall-bladder and down to the surface of the liver were now excised. The fistula was narrow; a silver probe was passed down 5 cm., but a bougie or elastic catheter 2 mm. in diameter could not be passed down until I had dilated with Lister's forceps. The catheter was left in and the border of the fistula united to the skin. The toilet of the abdomen was performed as usual. The drainage consisted of, first, a Mikulicz drain of iodoform-gauze surrounding a glass tube, over and upon the sutures of the ductus choledochus to the hilus of the liver; iodoform-gauze was packed over the pylorus and down on the duodenum; second, an iodoform-gauze strip along the gall-bladder or fistula out of which a few drops of clear, transparent bile escaped.

The wound was now united by a row of silk sutures through the whole abdominal wall.

The operation occupied two hours; the patient was in good condition at its close; pulse 110.

Five and one-half hours after the operation no fluid was found in the tube, which was, therefore, removed. The patient has no pain upon high percussion over the abdomen, but complains of pain in the stomach. *February* 22*d*. The patient feels weak and passed gas by the anus; complains of pain in the wound; has vomited dark-green matter, the vomiting of which causes an intense burning to the throat and mouth. 28*th*. Wound dressed. Wound in good condition and apparently no bile. Packing removed and replaced. *March* 3*d*. Wound dressed; a portion of the packing removed from the wound. Considerable sensitiveness on pressure over the lower part of the wound apparently caused by a tight suture, which was removed. Pain ceased immediately after dressing. 8*th*. Stitches removed, considerable pain on pressure along lower border of wound. Small drainage-tube in the gall-bladder was removed and sinus packed. No bile on dressings. 12*th*. The icterus has almost entirely disappeared. Patient feeling well. All of the gauze removed. The entire index-finger can be introduced into the wound leading to the duct. Very slight amount of discharge, consisting principally of blood, which followed the removal of the gauze packing. *April* 20*th*. The patient has gained seven pounds in weight since operation; is very much stronger. The sinus is small and closing in rapidly, and the discharge slight. The patient gained twenty pounds in weight in three months after the operation, and is now in perfect health.

Remarks. The opening of the ductus choledochus was 1 cm. above and to the right of the duodenum, and was 2 to 3 cm. long. When the stone was removed it was found that the wall was not thickened, and clear yellow bile flowed out. The probe and elastic bougie could be passed upward in the hilus of the liver 10 cm. and down behind the duodenum 5 cm., but it may be that the bougie was flexed in the duct.

The ductus choledochus was so dilated that it would admit the little and even the third finger easily. The wall was smooth; no more stones could be felt. The finger could be passed 5 cm. up to the hilus without reaching the upper end. The finger passed downward behind the duodenum, entered a pocket 2 to 3 cm. deep, with a smooth wall, in which I could feel no stone, and through which neither finger, flexible sound, nor elastic bougie could be passed into the intestine—exactly the same conditions as in the previous case.

Six mucous sutures were first inserted, and then ten sero-muscular, buried sutures, because of the clear, light-yellow bile which exuded all the time between the sutures first introduced.

A probe passed through the gall-bladder was arrested somewhere in the cystic duct; it did not go down into the ductus choledochus. I could feel no more stones in the ductus choledochus, cystic duct, or the gall-bladder. At first nothing but a clear watery fluid passed out of

the gall-bladder, but later there was a discharge of bile. A small drain was passed into the gall-bladder, the end of which was united to the skin. A Mikulicz drain was inserted down to the sutured wound in the ductus choledochus. The operation lasted two hours. I could see the yellow-spotted stone shining through the wall of the duct when pressed against it by two fingers behind the hepatico-duodenal ligament and the thumb on its anterior surface. The stone moved easily for 6 to 8 cm. in the ductus choledochus, from the hilus of the liver down to the pocket behind the duodenum. Sometimes it slipped up out of reach into the hilus of the liver, but could be brought down again by pushing the fingers behind the hepatico-duodenal ligament high up into the hilus of the liver. The stone could also be pushed down near the duodenum and to the right free border of the hepatico-duodenal ligament, the fingers being in the foramen of Winslow.

I thought that I could see the vena porta as a blue band about 1 cm. broad, and that I punctured it with the needle; but the bleeding stopped as soon as the sutures were tied. Hereafter in operations of this character I shall employ fine, curved, round-pointed needles and fine silk. The ends of the inner sutures should be kept long in order to make traction on the wound when the outer sutures are introduced. Straight needles cannot be used, as the bottom of the wound is deep and the operating-space narrow. The liver must be held up by both the index and third fingers of an assistant.

It is not necessary to find the opening into the duodenum, and this is often impossible; it could not be found in either of my two cases. The icterus was intermittent, and there was no inflammation of the wall of the duct. The choledochus stone could be moved for 8 or 10 cm. and obstructed the flow of bile like a ball-valve.

CASE IV. *Biliary colic and icterus two years ago; frequent attacks of indigestion and pain in cardiac region for two years without icterus; then second severe attack with icterus; later very frequent slight attacks twice a week; fever; loss in weight, 25 pounds in twelve days; slight icterus; no tumor in region of gall-bladder; operation; extensive adhesions over atrophied and empty gall-bladder; choledochotomy; removal of four stones; recovery; gained 40 pounds in forty days.*

H. J. W., American; weight, 140 pounds; height, five feet eleven inches; married; occupation, dial-maker. Family history good; no trace of hereditary disease. For the past two years the patient has been working in the baking-room of the dial department of a watch factory, where the heat is so intense that it can be endured for a few minutes only, and the men are obliged to work in relays. For eight years previously he had worked in the dial department. Patient's habits are good, he lives a simple life, smokes an occasional cigar, and at rare intervals drinks a glass of beer. So far as he knows he has not been exposed to accidents or contagion in any form. With the exception of the ordinary illnesses of childhood he has always been well until

three years ago, when he had a very severe attack of typhoid fever, from which he recovered, however, without complications.

The present illness commenced in August, 1893, when the patient had a sudden attack of pain in the region of the gall-bladder, accompanied by chills, fever, very intense pain, and marked jaundice. The jaundice gradually passed away, but from that time until February 5, 1895, he had frequent attacks of what he supposed to be indigestion or gastralgia, which were always sudden in onset, attended by severe pain, occasionally nausea, no vomiting, sometimes by chills and fever, and apparently independent of the food taken or the time of day. On February 5th, while at work, he was suddenly seized with severe pain in the region of the gall-bladder, chills, fever, but no vomiting. Within twenty-four hours intense jaundice appeared and marked constipation. He was seen by Dr. Webster on February 17th, and at that time, although enormous amounts of cathartics had been taken, his bowels had not moved for ten days. The jaundice was intense, the pain not severe, temperature 101°, tongue coated, a bad taste in the mouth, no vomiting, occasional sweats, urine limited in quantity and containing a large amount of bile. The patient lost about twenty-five pounds in weight in the twelve days intervening between the attack and the time he was seen by Dr. Webster, and averaged two attacks a week, which were preceded by a vague uneasiness, and were always accompanied by a chill, temperature as high as 102½°, pulse 60, sweating, marked increase in the intensity of the jaundice, increase of bile in the urine, and very light stools. The pain persisted from a few minutes to an hour or more, was always quite severe, and the patient learned from experience that relief was more quickly obtained when he lay on his abdomen.

In the intervals between the attacks the jaundice faded, but did not disappear entirely; the urine became lighter in color, but always contained bile; the feces were darker. Itching of the skin was annoying and constant.

Present condition. Inspection shows a fairly nourished body. Jaundice well marked, though not so intense as at any time since February 5th; stools light colored, but very much darker than during or a day subsequent to the attacks. Urine normal in amount, specific gravity 1020; no albumin, sugar, or casts; urea 0.017 per cent., strongly acid, and contains bile. Blood contains 78 per cent. hæmoglobin; pulse in sitting posture 60. Heart normal; respiratory system normal. Nervous system—the patient is cheerful and hopeful, although the characteristic despondency has been present, but without great melancholia, nausea, or severe manifestations of nervous perturbation. Digestive system—tongue is less coated than previously, bad taste in the mouth, worse during attacks. Appetite—can eat but simple, light food at intervals between attacks. Slight eructations, considerable nausea but very little vomiting, but none during the last few days. The bowels have moved under small doses of sodium phosphate. Patient has never had piles nor bloody stools. There is no enlargement of glands, the liver is normal in size, and there is no apparent enlargement of the gall-bladder.

On April 14th, I operated at Mercy Hospital, in the presence of Drs. Morgan, Roler, Raymond, Webster, Billings, Andrews, Black, and Thiel. Upon inspection the patient was rather lean, skin of yellowish tint, but not exactly icteric; conjunctiva slightly yellowish. Ether was the anæsthetic, and was given by Dr. Weir.

Operation. A lateral longitudinal incision, 18 to 20 cm. in length, was made at the outer border of the right rectus muscle from above the border of the ribs to below the umbilicus. After packing with flat sponges the parietal peritoneum was sutured to the skin. Upon examination I found that the liver was drawn or extended more to the right than normal, so that the suspensory ligament of the liver and part of the left lobe presented in the middle of the lateral wound. The wall of the stomach presented below the liver; the groove for the gall-bladder was situated to the right of the wound and could not be brought into view without extending the field of operation to the right, and therefore a transverse incision, 6 to 8 cm. in length, became necessary. I could now reach the groove for the gall-bladder—the incisura between the right and the anterior lobe. At this point was found a cord-like adhesive band, 1½ cm. broad and 8 mm. thick, binding the liver to the abdominal wall, which was probably the cause of the abnormal position and retention of the liver. This band was cut after double ligation and transfixion.

The gall-bladder could not be seen, as the incisura was filled with omentum, the wall of the stomach and the lesser curvature of its pyloric portion, which was at this point adherent to the liver and omentum.

The division of the omentum between double ligatures did not bring the gall bladder into view, but exposed the transverse colon. The division of the ligamentum hepatico-gastricum made it possible to push the stomach to the left, there to be retained by a flat sponge. The loosening of the colon by division of the ligamentum gastro-colicum finally brought the gall-bladder into view. It was empty, contracted, 2 cm. broad and 4 cm. long, and whitish. Upon blunt dissection backward with the finger and Kocher's sound, the hilus of the liver with the foramen of Winslow were laid bare, and also the bile-ducts and descending portion of the duodenum.

I could now feel a movable stone at this point, and could insert the index and third fingers into the foramen of Winslow behind the hepatico-duodenal ligament, and grasp between these two fingers and my thumb the vena porta and bile-ducts. With the fingers of my right hand I pushed the duodenum to the left and could feel two movable stones which glided from right to left in the common duct with absolute ease and freedom. They could be dislodged to the left down behind the duodenum and then could be pushed upward and to the right into the hilus of the liver. A slightly enlarged lymph-gland lay on the anterior surface of the common duct. The vena porta could not be seen. After packing with more sponges the first stone was now pushed down to the left and fixed in position against the anterior wall of the common duct close to the right border of the duodenum. An incision, 1 cm. long, longitudinal to the axis of the common duct, was now made on the upper aspect of its anterior surface down to the stone, whose yellowish-white nodulated surfaces presented in the wound. Transparent light-yellow bile flowed out of the incision, from which Dr. Black took cultures, but which he found to be sterile. A round stone (see Fig. 3, No. 1) was lifted and pressed out of the opening with the help of Kocher's sound, which was passed into the duct behind it. This stone was globular and 14 mm. in diameter. A second stone of the same size and shape was now removed; also a third stone a little smaller, probably 12 mm. in diameter.

I now explored the common duct with my little finger, which passed down behind the duodenum 2 cm. into a smooth cul-de-sac in which I could feel no stone. I then passed the finger upward for 2 cm., when it was grasped rather tightly by the walls of the duct, but here also no stone could be felt. A silver probe was now passed first downward, which did not enter the duodenum, and then upward for 8 cm., not into the gall-bladder, but into the hepatic duct. On withdrawing it I felt a grating as of a stone, and manipulation between the fingers of the contents of the hepatico-duodenal ligament brought forth a fourth stone smaller than the preceding, globular, about 6 mm. in diameter.

An elastic olive-pointed bougie, No. 10, American, was now passed into the common duct, first downward, when it entered the duodenum and could easily be passed down its entire length; then upward about 10 cm. into the liver, but not into the gall-bladder. The wall of the common duct was normal, but was rather thinner than usual.

The wound in the common duct was now sutured, first by mucous membrane sutures; the mucosa was reddish-grayish white, soft, with longitudinal folds. It was held with forceps, three silk sutures applied, upon the knotting of which the flow of bile almost ceased; second, the seromuscular sutures which took in 4 mm. of the outer layer of the wall with its covering-layer of hepatico-duodenal ligament. Five sutures were first applied, but the flow of bile was rather increased than diminished, and bile was seen to come out of the needle-punctures. Two or three more sutures were applied obliquely and transversely to the others in the axis of the common duct, but even then the oozing of the bile did not completely stop. As I considered that when the pressure on the ducts and the liver which, was being held up with some difficulty by two assistants, was relieved, the flow of bile would stop, I resolved to close the wound.

Boric-acid gauze was packed in the hilus of the liver over the common duct, the six large abdominal sponges removed and one large clean sponge spread over the abdominal contents behind the wound in the abdominal wall.

The abdominal wound was closed by suture of the divided muscles in the transverse wound with buried silk sutures, and then by heavy transperitoneal sutures through the entire wall to the skin.

A rubber drainage-tube 1 cm. in diameter was passed up to the wound in the common duct; borated gauze packed in above the surface of the tube on to the hilus of the liver and also below the surface of the tube, and the abdominal wound left open for 4 to 5 cm. The wound was then dressed in the usual way.

The operation lasted an hour and a half; the pulse became better and stronger during the latter part of the operation.

The next day the outside dressings were removed and were found to be thoroughly saturated with bile, probably 10 to 12 ounces, and renewed.

On *April* 17*th* the wound was again dressed. The deeper layers of the dressing were soaked with bile, but probably not more than 2 or 3 ounces. The wound looked well. 18*th*. The bowels moved spontaneously, the feces were ochre-brown in color. 20*th*. There was very little discharge of bile until the patient was turned on the right side, when the dressing became soaked in about half an hour with probably 3 or 4 ounces of a greenish-yellow fluid. 21*st*. When the

patient was turned on the right side the discharge again became profuse, and soon assumed a fermentative odor. When the wound was redressed, the discharge in the upper layers of the dressing had a sour, fermentative odor, but the dressings next to the wound were sweet, the discharge resembled warm digesting milk, but was not of an intestinal character. The packing was now removed, and the wound found to be in healthy, granulating condition. A little stitch-necrosis was present. The superficial stitches were removed, the wound washed with a saturated solution of boric acid, and repacked lightly. 22*d*. After an enema of magnesium sulphate, the bowel-movement was of a dark greenish color. 23*d*. The wound was redressed; about half an ounce of discharge was found on the proximal dressing, very slightly sour in odor, and chylous in appearance. The drainage-tube was removed and found plugged at the bottom with a mass of pressure-necrosis material. The tube was not replaced. The wound was irrigated with warm saturated solution of boric acid and lightly repacked with borated gauze. 25*th*. The wound was redressed; about 3 ounces of discharge of the same chylous appearance as before, but with a great admixture of bile, appeared on the dressing. Upon removal of the dressing 3 or 4 drachms of odorless pure bile floated down on the surface. Streak and stab cultures were made from both the chlyous-like discharge and from the bile, both of which were negative.

On April 28th Prof. W. E. Morgan made the following report:

"The patient still discharges through the wound and from the duct a quantity of the chylous-appearing fluid, and for the past two days a considerable quantity of bile also, 2 to 3 ounces in twenty-four hours. As it occurred to me that the fluid might possibly be pancreatic in origin, I subjected some of it to a physiologic chemist for examination, and enclose his report. The discharge in question certainly comes from within the duct, and not from the surface of the wound, for I have been able at the last two dressings to watch its accumulation in the deepest part of the wound. At first, it looks like a coarse emulsion of fat in water, then slowly separates into two layers, the deeper one milky in appearance, the upper one like clear bile. I would naturally think the oily portion would be lighter in specific gravity, but perhaps the admixture of mucus may make the deep layer heavier; it certainly is more adherent. The patient is doing well."

Report of chemical examination of the discharge by Dr. Charles H. Miller:

"Source: liquids obtained by washing out the dressing.

"A. *External Dressings.* The dressings were colored green from the dried discharge, which had ascended highest from more perfect capillary attraction. On washing, obtained 350 c.c. green liquid of neutral reaction with a specific gravity of 1.016, which contains a considerable quantity of bile, traces of serum-albumin, and practically nothing else.

"B. *Internal Dressings.* The internal dressings, especially those used for packing the wound, yielded 200 c.c. of a yellowish-white, creamy liquid of slightly acid reaction, due to lactic acid. Specific gravity, 1.023. On standing, this gave a heavy white precipitate containing pus-corpuscles (Donné's test). The supernatant liquid is strongly albuminous, and contains mainly serum-albumin with a small amount of peptone.

"Bile was present in small quantity; chlorides; phosphates, as salts of

the alkali; urea, in minute traces only; fat, traces only; blood, in minute traces only (guaiac test); sugar was not present.

"The results of the approximate analysis would indicate that the liquid is a mixture of lymph and bile containing large numbers of pus-corpuscles. The examination was made twenty hours after the liquid was obtained. The trace of acidity is attributed to bacterial decomposition after removal from the body."

On November 9, 1895, I received the following report from Dr. Webster:

"In reply to your inquiry regarding my brother's health, I am pleased to write you that he gained forty pounds in weight in forty days after leaving the hospital, and has not missed one hour's work since recovery."

REMARKS. The operating-space was small and the application of sutures in the common duct difficult. For this purpose small, rounded, curved needles are necessary. If the wall of the duct is thin or normal, it is not easy to close the duct hermetically.

The liver was normal in color, little if any enlarged, and its borders were not rounded. On the upper surface of the right lobe I could feel numerous (fifty or more) small superficial, hard or resistant nodules from the size of a pin's head to that of a split pea. They could be seen as slight prominences over the surface of the liver. The liver-tissue was perhaps a trifle darker than normal, but neither whitish, yellowish, nor green. When I felt these nodules before I had found the stone in the common duct, I feared they were malignant metastatic tumors in the liver, due to a primary tumor somewhere around the hilus; but their large number, uniformly small size, and color made me consider them peripheral dilatations of the small bile-ducts. This was made certain by finding stones in the common duct. The nodules were not distributed all over the liver, none could be found on the lower surface; they were limited to a territory the size of the palm of the hand on the convex surface of the right lobe, and each was almost in contact with the others. My belief is that a large branch of the hepatic duct had been occluded by a stone, possibly by the smaller one (No. 4), or a stone which I did not discover. It may thus be well, as was done in this case, to pass an elastic bougie or probe and attempt to dislodge a stone situated higher up in the larger ducts of the liver. The increased flow of bile toward the end of the operation, at the time of incision and suture of the common duct, may have been due to the successive evacuation of a distended and overburdened territory of peripheral bile-ducts, and it is more than likely that the creamy fluid so abundantly discharged in the early part of the after-treatment was the contents of these dilated peripheral bile-ducts, which contained not bile, but an acholic serous fluid.

The peculiar nodulated condition found in the lower right half of the

upper surface of the right lobe of the liver was due to dilatation of the distal ends of the bile-ducts. Courvoisier mentions one case in the literature, in which the superficial branches of the bile-ducts presented a varicosed appearance (*loc. cit.*, p. 56), and four cases in which the superficial terminal bile-ducts were transformed into small cysts the size of a cherry, protruding from the convex surface of the liver. It is natural that large quantities of bile should be evacuated even during the operation, after the opening of the common duct, and that the flow of bile should be considerable for several days thereafter. In such cases it might be advisable not to close the common duct entirely so that evacuation of bile might be permitted through the wound.

Another remarkable phenomenon observed in this case was the discharge of large quantities of a milky fluid which did not contain bile-pigments, and which was characteristic of the acholic condition. Courvoisier found in the literature ten cases of hydrops of the biliary ducts, which were filled with a watery, colorless, or slightly mucoid fluid which did not possess any of the characteristics of bile. In these ten cases the entire system of the biliary tract, possibly with the exception of the gall-bladder, was filled with a hydropic fluid of this nature. In none of these ten cases was the obstruction due to stone, but to tumors within or outside of the common duct, or to obliteration of the duct in one case. He explains the acholia by assuming that cessation of the secretion of bile may under certain circumstances be caused by high pressure on the liver-cells due to the stagnation of bile behind the obstruction. In this case the acholia was partial, and was caused by a stone, probably a small stone, which was at last removed and dislodged by introduction of the probe high up through the hepatic duct into one of its branches. This phenomenon is remarkable in both these respects, as it is the only observation of the kind on record.

As the patient has had no disturbing symptoms up to the present time, eight months after the operation, and as the acholic territory became entirely empty shortly after the operation, it is not likely that a stone which had not been removed could have caused the localized dilatation of the ducts, nor that the acholic fluid could have come from any other territory than that of the dilated ducts. Prof. Morgan thought that the fluid might be pancreatic, from division of the pancreatic duct during the operation; but the incision in the common duct was nearly an inch from the pancreatic duct, and the fluid was shown to be non-pancreatic by the chemical examination made by Dr. Miller and reported above.

When it is impossible to close the common duct by suture so that no bile escapes, thorough drainage is important, namely, a rubber drain up to the sutured wound in the duct, carefully packing gauze around it, not only in the hilus, but out toward the stomach to the left, toward the

flexure of the colon to the right, and to the transverse colon downward. This packing should be done before the closure of the abdominal wall is commenced, while the liver is still being held up by the assistants so that the nooks and corners to be packed may be clearly seen; a sufficiently large opening should also be left in the abdominal wound to allow free exit for the bile, through the tube and packing.

CASE V. *Six attacks of biliary colic since December, 1894, the later ones followed by icterus; frequent short attacks of pain in epigastrium; slight icterus; loss of weight, 23 pounds; no tumor in region of gall-bladder; diagnosis, stone in common duct; operation; adhesions to gall-bladder; enlarged glands in hilus; no stone found; change of diagnosis to malignant tumor in head of pancreas; cholecystenterostomy with Murphy button; death on fourth day, probably from cholæmia; autopsy, no malignant tumor; small gall-stone size of a cherry-stone found in diverticulum of Vater.*

P. W., railroad-clerk, aged twenty-five years, was admitted to Emergency Hospital, May 18, 1895. Family history negative, with the exception of his paternal grandfather, who, in the course of an illness of three weeks, during which he was much jaundiced and had excruciating pain in the region of the liver, passed a number of gall-stones.

The patient had the ordinary diseases of childhood, and has had two attacks of gonorrhœa. He also had typhoid fever five years ago. He seldom drinks liquor, never to excess; uses tobacco sparingly; has a good appetite, and no cough. Has never suffered from any accident; is generally constipated.

The present illness commenced in December, 1894, when he was awakened early one morning by a slight, dull aching pain in the epigastric region. The pain continued quite severe in character, notwithstanding a warm compress, for about nine hours, when it suddenly disappeared. This time he did not notice that he was jaundiced. The character of the pain in this attack was somewhat paroxysmal. Each paroxysm would last from ten to fifteen minutes and would be followed by an interval of from half an hour to an hour and a half. The second attack occurred about the last of February, 1895. It commenced early one morning. The pain gradually increased in severity, and then suddenly disappeared exactly as in the former attack. This attack lasted about twelve hours, but for six or seven days afterward he felt more or less ill, and his appetite was poor. He did not notice any jaundice. The pain was localized in the epigastric region in a territory about three inches in diameter. The third attack occurred on March 28th. In the morning of that day he had a disagreeable feeling accompanied by fleeting pains in the epigastric region. In the afternoon he felt cold and chilly, but had no distinct chill. About 3.30 P.M. the pain began to increase rapidly in severity and soon became intense. After about fifteen minutes it suddenly disappeared. About two hours later he had another paroxysm, but not so severe as the first. This attack was not accompanied by jaundice. Three days later, while he was on his way home, he vomited three times on the train and prespired profusely. He had no pain, but had three very loose movements of the bowels. The next day he did not feel well, but had no pain.

The following day the fourth attack seized him and persisted for two

hours and a half, but was not so severe as the former attack. During this attack he was not jaundiced, but his face was discolored. The day after this attack he was decidedly jaundiced, and the urine was very dark. He had painful attacks once or twice during the day. During the succeeding ten days he had an attack of pain every day, which lasted from half an hour to two hours, at the end of which time it would suddenly disappear. The jaundice was noticeable for about a week after its appearance. At the end of this period of ten days the pain continued in a less severe form for about five days. On April 19th he had a very severe attack which lasted about three hours, and for two weeks thereafter had less severe attacks of pain each day. The pain was always included in a space in the epigastric region, about three inches in diameter.

During the two weeks preceding his admission to the hospital he had three attacks of pain. The first two were not severe, but the last attack, which occurred on May 14th, lasted for twelve hours. For the first four hours of this time it was not especially severe, but from this time on there was constant pain of varying intensity. He vomited three times during this attack, while the pain was at the maximum, and the vomiting was followed by a cessation of pain for about half an hour. He was distinctly jaundiced after this attack.

The character and intensity of the pain were varied by the patient's position. If he lay on either side or on his stomach, the pain was increased. When he would lie on the back, with the right thigh flexed to a right-angle, and the left leg drawn up and thrown across the right thigh, or with both thighs flexed as much as possible, or when he would sit up in bed and draw the knees up to the chin, the pain was less severe. The patient never tried to stand erect.

After the third attack the urine became very dark and continued so for about ten days. After the next attack the duskiness of the urine continued for about five days. On May 14th it again became very dark, and has remained so up to the present time. On May 17th he had another slight attack, which lasted only two or three minutes. During the attacks of pain pressure of any kind was intolerable, and any noise or jarring in or around the room seemed to increase the pain; pressure during the free intervals, however, was not attended by pain.

The patient's usual weight is 165 pounds, but on April 15th he weighed only 142 pounds, a loss in weight of 23 pounds.

No stones have ever been found in the feces.

Diagnosis before operation. As the patient had had six distinct attacks of gall-stone colic, increasing in severity and duration, and increasing also in frequency; as the pain was located in the epigastric region, and not in the region of the gall-bladder; as icterus of medium degree followed the later attacks; as marked emaciation (a loss in weight of 23 pounds) was present; and as there was an absence of tumor or pain in the region of the gall-bladder, I made a diagnosis of floating gall-stones in the common duct, feeling certain that this was a typical case, as all the characteristic symptoms were present. I therefore advised operation.

Operation. After the usual preparations the operation was performed on May 10th. The patient was anæsthetized by ether, an incision was made over the gall-bladder, extending downward from the lower border of the costal arch to the level of the umbilicus through the skin and super-

ficial fascia. The rectus muscle was then separated by blunt dissection, and an opening made in the peritoneum, which was enlarged to the limits of the wound. The peritoneum was sutured to the skin, and the intestines protected by large flat sponges. The wound was now enlarged upward to the costal cartilages and downward to half an inch below the umbilicus. Extensive adhesions existed between the liver and the surrounding organs. These adhesions were loosened with considerable difficulty by blunt dissection or division between ligatures, and the common duct, artery, and vein could be felt by the examining finger passed through the foramen of Winslow. Careful palpation of the common and cystic ducts was negative, as no stones could be felt. The liver was then palpated, and hard, round nodules were found on its surface, which felt like dilated hepatic ducts. The head of the pancreas was enlarged, and I was inclined to attribute to this fact the symptom of jaundice due to pressure upon the common duct. Some enlarged lymphatic glands were found, one as large as a horse-chestnut. One of these glands was removed for examination. To determine the patency of the common duct, a flexible sound was passed down through an incision into the gall-bladder, through the cystic duct into the common duct, and finally into the duodenum.

I now made a diagnosis, which afterward proved to be erroneous, of malignant disease of the head of the pancreas. I therefore attached the gall-bladder to the jejunum by means of a medium-sized Murphy button. This procedure was attended with extreme difficulty on account of the small calibre of the atrophied gall-bladder. The abdomen was then thoroughly cleansed, and two strips of gauze inserted, one above and the other below the point of anastomosis. The abdominal wound was closed with interrupted sutures, which were passed through the entire wall. One of these sutures was placed, but not tied. The ordinary dressings were now applied. The operation occupied two hours.

Twenty-four hours after the operation the temperature began to rise, and four days later reached 104°, attended with vomiting, pain, a dry tongue, with no tympanites. The patient died on the fourth day.

Autopsy. Upon opening the abdomen no diffused peritonitis was found; the gauze in the hilus was adherent to the surrounding intestines and stained with bile. There was no leakage from, or peritonitic exudate around, the cholecystenterostomy, The liver, together with the stomach, duodenum, pancreas, and a loop of jejunum at the site of the anastomosis, was removed entire.

The liver was of normal size and appearance; the atrophied gall-bladder was united with the jejunum by a perfectly tight agglutination at the place of anastomosis.

Careful palpation of the hepatico-duodenal ligament failed to detect any stone or dilatation of the common duct. The pancreas was normal on palpation, and its head did not now appear enlarged, nor were any nodules nor abnormally hard territories to be felt in it.

I now opened the duodenum by a longitudinal incision over the head of the pancreas in order to examine the duodenal opening of the common duct. The inner surface of the duodenum appeared normal, and presented the usual transverse folds. On the inner surface of the posterior wall of the duodenum at the point where it crossed the head of the pancreas, I could now see a small, round polypus, one centimetre in diameter, movable freely from side to side, but less movable in a vertical

direction; it was covered with mucosa, and was attached to the duodenum posteriorly by a broad base. I supposed this to be a small submucous lipoma or fibroma, protruding like a polypus into the lumen of the intestine. Upon closer examination, however, I found on its convex surface, near the upper end, the opening into the common duct. A sound passed easily from this opening into the duct, which appeared of about normal calibre. On passing the sound through the opening in the duodenal mucosa I felt a slight grating as from a stone at the location of the supposed polypus. I now made an incision from the opening downward through the mucosa covering the polypus, and found a gall-stone the size of a cherry-stone (see Fig. 5) in the supposed polypus, which was thus shown to be the diverticulum of Vater dilated downward so as to form a small pouch wherein the stone was contained. There was ample room over the stone to allow the passage of a bougie No. 14, French scale, in the common duct, as had been done during the operation. No other stones were found in the common duct, cystic duct, or gall-bladder.

Microscopic examination of the liver showed a slight degree of fat-infiltration of the liver-cells, most of which contained one or more oil-globules, not large enough, however, to fill the entire liver-cells, the contour of which could almost always be recognized. The branches of the hepatic vein at the centre of the acini were somewhat dilated. The smallest bile-ducts could be seen to be not dilated, and to have normal epithelium. Around the periacinous branches of the vena porta there was slight infiltration with leucocytes, but this did not extend from the paravascular spaces out into the acini between the rows of the liver-cells.

It was thus seen that a slight degree of beginning interstitial hepatitis and a medium or slight degree of fat-infiltration were the only abnormal conditions to be found in the liver.

Remarks. As I found the gall-bladder small, empty, and retracted, surrounded by the usual characteristic adhesions, I confidently expected to find a stone in the common duct, and was greatly surprised to find no stone upon palpation of the hepatico-duodenal ligament. The large lymph-glands in the ligament were soft; this might have been from inflammation, as in case of choledochus stones, but might also occur as a result of sarcoma. As I now found the head of the pancreas unusually large and firm, I changed my diagnosis, and thought of a tumor—a carcinoma or sarcoma—in the head of the pancreas, which had caused the intermittent paroxysms by compression of the common duct in its course through the head of the pancreas. I therefore opened the gall-bladder, first, to determine the patency of the common duct, and, second, to establish a cholecystenterostomy. As the flexible olive-pointed bougie passed easily down into the duodenum, I thought that no stone could be present, and that the bougie might have passed by a tumor in the head of the pancreas large enough to make compression of the common duct. I resolved upon cholecystenterostomy, because I expected the tumor in the head of the pancreas to increase in size and gradually to cause more compression.

The stone, covered with the soft wall of the diverticulum of Vater, was so small as to escape detection even after the duodenum was opened at the autopsy. If I had used a metallic instead of a flexible sound, I might possibly have detected the stone by the grating sensation at the location of the diverticulum of Vater. Had this been the case, I would have been able to remove the stone either from the ordinary incision in the common duct or from the duodenum, after incising the latter.

The small stone found in this case had a rather roughened, crystalline surface, with sharp, jagged points, or rather wavy ridges, like a fine saw. It imparted a feeling of grating or scratching when rubbed over the skin of the dorsum of the hand. It is possible that this stone would cause more destruction of epithelium and subsequent inflammation than the smooth stones found in Case IV.

The hard, swollen condition of the pancreas, and especially of the head of the pancreas, led me to believe during the operation that a malignant tumor existed, which had caused the biliary obstruction, and this so much the more as I was unable to detect the small stone in the diverticulum of Vater. The autopsy demonstrated that the stone was present, and that no tumor of the pancreas existed; consequently the swelling or enlargement of the pancreas, which I felt during the operation, must have been of an inflammatory nature. This is in conformity with the considerable inflammatory swelling of the lymph-gland, the size of a small walnut, in the hepatico-duodenal ligament, on the anterior surface of the common duct. Although I had in other cases found swellings of the lymph-glands in this location, as a symptom of the inflammation which probably caused the adhesion between the biliary tract from the gall-bladder to the end of the common duct, on the one hand, and all the movable adjacent organs—the omentum, stomach, transverse colon, abdominal wall, and duodenum—on the other, I had not before observed any marked inflammatory swelling of the pancreas.

Similar observations have recently been reported by Riedel in a communication made before the Section of Surgery of the Convention of Naturalists in Lubeck on September 19, 1895. Riedel found inflammatory changes in the pancreas following gall-stone disease, which caused so considerable a swelling as to give the impression of a large pancreatic tumor. The author mentioned two cases in which these apparent tumors disappeared entirely, and a third case in which the autopsy demonstrated the simple inflammatory character of the tumefaction.

CASE VI. *Tuberculosis of knee and shoulder for which resections were made; last operation three years ago; two years ago, pain in epigastric region; May, 1895, pain over liver; July, 1895, pain in epigastric region, with icterus; August, 1895, third attack, medium degree of icterus, emacia-*

tion; loss of weight, 53 pounds in seven months; no tumor in region of gall-bladder; choledochotomy; two large stones and one small stone removed; cholecystotomy; one stone removed; recovery; gained 38 pounds in two months.

Miss A. E. D., aged twenty-four years, was admitted to Passavant Memorial Hospital, October 5, 1895. Family history negative. Patient had the ordinary diseases of childhood; she began to menstruate at the age of sixteen years, and has always been regular. She was reared at the breast, and has never used cow's milk to any extent.

In 1887 I operated upon her first, making a resection of the right knee-joint on account of tuberculosis. A second operation was performed six months later. Six months after this I operated upon her for tuberculosis of the right shoulder-joint, and since that time I have twice operated upon the right shoulder, the last operation being performed three years ago.

Her present illness began in 1893, when she had severe epigastric pain of a dull, aching character. The pain persisted for about a week, but she remained in bed for a week after this. The pain was accompanied by vomiting-attacks, which recurred twice a day. The patient thinks that she was given emetics, for the vomiting attacks always gave relief, which continued until she took solid food, when the pain would recur, to be relieved by another attack of vomiting. During the second week of this illness she had no attacks of vomiting. At this time she had no trouble with her bowels, and was not jaundiced, although she thinks her skin was a little darker than usual after the attack. During the last two years she has had slight attacks of pain, which were usually followed by slight darkening of the skin.

In May, 1895, she had a severe attack, which began suddenly, with dull pain, increased on deep respiration, in the right side, in the region of the costal arch, over the liver. This pain continued until the latter part of June, but was not attended by vomiting. The pain then grew worse, and became so severe that on July 1st she was obliged to take to her bed. Two days later the attacks of vomiting recurred. She vomited continually for two weeks upon the slightest provocation, even the ingestion of a few drops of water would cause an attack. At this time vomiting gave no relief from the pain. The pain had now extended until the epigastric, hypochondriac, and lumbar regions were included, and these parts were sore and tender to the touch.

On July 6th she had jaundice for the first time, and this has persisted up to the present time. She improved slightly, so that she was able to be up and around about July 20th; but on August 5th she had a third and very severe attack, localized in the epigastric region, but without pain in the sides, except at the maximum of the attack. Forced vomiting gave her immediate relief, and up to this time she always nauseates herself before she vomits. This third attack lasted for about two weeks. Since that time she has had occasional pain, but no continued attack. Solid food always causes or increases the pain. During the attacks there is great tenderness in the epigastrium, but this tenderness disappears with the pain.

There has been a marked diminution of weight. In February, 1895, she weighed 133 pounds; in October, seven months later, she weighed only 80 pounds, a loss of weight of 53 pounds.

Upon examination the patient was found to be very thin, her eyes

surrounded by dark circles; the skin was a dark greenish-yellow, but not distinctly icteric. On account of her previous history and this bronzing of the skin I thought of Addison's disease, tuberculosis of the suprarenal capsules. The thoracic organs were normal, the abdomen flat, liver-dulness normal, no tumor in the region of the gall-bladder. The borders of the liver could not be distinctly felt. There was no tumor in the epigastrium, and the aorta appeared normal. There was slight tenderness upon deep pressure in the median line midway between the xiphoid appendix and the umbilicus, but it was indistinct, and no swelling or resistance could be felt. Dr. Conley states that the patient says she has passed many gall-stones.

Operation. On October 8th, assisted by Dr. Waters, who administered the ether, Drs. Brougham and Brown, and in the presence of Dr. Conley, I made a longitudinal incision an inch and a half to the left of the linea alba in the outer third of the rectus abdominis muscle. The peritoneum was stitched to the skin from the border of the ribs to the umbilicus, and later on to one inch below this point. A flat sponge was inserted to push back the omentum. Exploration revealed the border of the liver and the end of the gall-bladder, the latter appearing as a whitish, empty, folded sac, the end of which protruded like the end of a finger. It was 1½ cm. in diameter, and firm to pressure, as if it were contracted around a small stone. This led me to believe that the lumen of the gall-bladder was obliterated behind a stone lodged in its distal end. The finger could be easily passed down to the neck of the gall-bladder and the cystic duct, and from here into the foramen of Winslow. The hepatico-duodenal ligament was palpated between the index-finger and thumb and two floating stones felt therein, which could be easily moved from the hilus down to the posterior surface of the duodenum.

The abdominal incision was prolonged to one inch below the umbilicus, making the incision in all 12 or 14 cm. in length, in order to gain operating-space without the necessity of making a transverse incision. The sponge over the stomach was held to the left by the fingers of an assistant, the liver held up by the fingers of another assistant, and I had my left index-finger in the foramen of Winslow. The tip of the finger could be seen through the hepatico-gastric ligament, above the hepatic artery which could be seen and its pulsations felt. One of the two stones was pressed against the anterior wall of the hepatico-duodenal ligament, whereupon I saw a blue strip or line above the stone, which I feared was the vena porta; but upon releasing the pressure I saw a branch passing downward from this vein, and therefore judged the blue line to be a branch of the vena porta dividing in the loose layer of the hepatico-duodenal ligament on the anterior wall of the left half of the dilated ductus choledochus. I now incised the duct over the stone below the upper horizontal branch and to the left of the descending branch, being guided by the stone, which showed through the wall of the duct, or rather gave the wall of the duct a whitish appearance. No enlarged lymph-glands were found. When the stone was reached, clear yellow bile escaped. The first stone was then squeezed out and the second stone brought into view and pushed out. I then easily inserted my little finger into the ductus choledochus for a distance of 2 inches, behind the duodenum, where I felt a small stone, and up into the hilus of the liver, where I could feel no stones. By

manipulation with the left third finger in the duodenal half of the duct and the right index-finger and thumb on the duodenum and head of the pancreas I could push the small stone out on the end of the left third finger. I then attempted to bring the stone out into the incision in the common duct, but it would always slide off the finger. I then introduced a small sharp spoon-curette, but could not extract the stone with it. Finally, with the left third finger in the duct, and the sharp spoon, I brought the stone out into the wound, where it broke into small pieces, which were removed in the form of débris.

A flexible bougie, No. 13, French, was now passed through the common duct into the duodenum, and another bougie up into the liver. A flexible silver probe passed down through the duct to the duodenum did not pass into the duodenum, but no stones could be felt; and when the probe was passed up into the liver no stones could be felt.

The incision in the common duct was closed by five or six silk mucosa sutures and a continuous suture through the wound in the anterior layer of the hepatico-duodenal ligament. Notwithstanding the introduction of additional sutures, bile still oozed out. The field of operation in the common duct was now cleansed and packed with sterilized gauze. As the stone in the end of the gall-bladder was immovable, I now incised the wall of the gall-bladder over it. The wall was thick and considerable hemorrhage followed the incision. The stone, which lay in a bed of mucosa which enclosed it snugly, was now removed, but broke into débris during this process. I introduced my little finger into the gall-bladder and found it empty, but so contracted as only just to permit my finger, 14 mm. in diameter, to pass down to the cystic duct, where no stone was felt.

A drainage-tube was now inserted into the gall-bladder and gauze packed in over the wound in the common duct, up between the liver and stomach, and above and below the drainage-tube, which was passed down to the incision in the ductus choledochus. The gall-bladder wound was now united to the upper end of the external wound, the lower part of which was closed. The union of the wound was then completed with the exception of the opening for drainage-tubes and gauze-packing in the wound over the common duct.

The operation lasted an hour and a half. At its close the patient was in good condition with strong pulse. The operation was easy, as there were no adhesions. I feared tuberculosis, but found the peritoneum normal and no enlarged glands in the hilus of the liver. I also feared collapse from the cholæmia, but the patient bore the operation well, and five hours afterward was in good condition; pulse 80, strong; no vomiting; and was anxious to see the stones which had been removed.

October 9th. The patient had a fairly good night; no vomiting. The dressings were removed and found to be soaked with bile coming mostly from the large tube leading to the common duct. She vomited three times during the day a small quantity of bile, and on the day following vomited considerable quantities of bile. 11*th.* She vomited several times very small quantities of bile. 12*th.* Wound was dressed, found to be perfectly clean; no bile was found in the dressings, but only a serous, odorless discharge. 13*th.* A portion of the gauze-drain in the gall-bladder and of that passed down to the common duct was removed. The icterus appeared to be less, and the patient's general condition was much improved. 17*th.* All the gauze was removed from the gall-

bladder wound; patient was continuously improving. 19*th*. The remainder of the gauze-drain and also the drainage-tubes were removed. No bile in the dressings. 21*st*. Stitches removed, wound in good condition, and the discharge materially decreased.

December 17th. Wound healed and patient left hospital. She has gained thirty-eight pounds in weight, looks well, feels well, has a splendid appetite, and feels no pain.

(To be continued.)

NIGHT-TERRORS (PAVOR NOCTURNUS).

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Up to the present time the above subject has received but scant attention at the hands of English writers on medicine. In the works of Bristowe[1] and Gowers[2] I can find no description of it. Hilton Fagge,[3] in his excellent treatise, dismisses the subject with about half a dozen lines. In fact, in no one of the books on general medicine or nervous diseases can I find any account of the complaint that is to me at all commensurate with interest and possible importance attaching to it. Of course, as might be expected, in the works of the special writers on children's diseases the subject receives more attention; but even here, I think, exception may be taken to the insufficient manner in which it is discussed by most. Thus, in the justly esteemed work of Eustace Smith,[4] night-terrors are stated to be, in his belief, solely the result of indigestion, and therefore considered as not requiring detailed notice. Donkin[5] does not dwell at any length on the subject, though he evidently considers that night-terrors indicate nervous disorders. Goodhart,[6] although he seemingly deems the complaint of importance, and gives excellent advice regarding it, only affords about half a page to its consideration. In the exceedingly able work of Ashby and Wright[7] I cannot find it even mentioned. In the works of West[8] and Angel Money[9] the subject is treated at some length, but the descriptions given of it are, in my opinion, unsatisfactory, and are undoubtedly contradictory in their teaching.

In France more attention has been paid to the subject, and valuable contributions to it are to be found in the writings of Bouchut,[10] Moizard,[11] and others.

For German authorities night-terrors would seem to afford considerable attraction, and since Hesse[12] wrote about them in 1845, more or less exhaustive accounts of them have followed from the pens of many. Chief among such writers may be mentioned Henoch,[13] Soltmann,[14] Steiner,[15] Silbermann,[16] and Niemeyer.[17] It is true that most of these

have differed widely in their interpretation of what constitutes night-terrors and the import they place upon them, but this in no wise diminishes the value of their contributions to the subject.

If not so numerous as the German, the American additions to the literature of the complaint are nevertheless of extreme value. For a proof of this I need only to refer to the writings of Lyman[18] and H. C. Wood.[19] In an exceedingly able article, too, Dr. C. P. Putnam[20] gives a description of the complaint and a valuable summary of the opinions regarding it. I am not at one with him as to the conclusions he draws as to its nature, but I willingly admit my indebtedness to him for many references which I might possibly have otherwise missed.

Satisfactory or unsatisfactory as the writings on night-terrors of the authors of these different nationalities may be, there is one fact concerning them that must strike the most cursory reader. This is the extreme divergence of opinion among them as to the nature and importance of the complaint, and at first sight it would seem a hopeless task to attempt to reconcile them. My colleague, Eustace Smith, for instance, in his work on *Children's Diseases*, ascribes night-terrors to digestive troubles, but of late, I believe, he considers adenoids and other naso-pharyngeal disorders as potent factors in their causation. Warrington Haward[21] attributes them to enlarged tonsils. Ringer[22] considers them as arising from indigestion. West agrees with this, although he says he has known serious brain-trouble arising from them. Goodhart thinks them allied to somnambulism and nocturnal incontinence. Moizard, Bouchut, Heise, Soltmann, Silbermann, H. C. Wood, and others link them with epilepsy. Angel Money, too, calls them a form of cortical epilepsy. Donkin mentions them among the emotional and other nerve disturbances which are common in rheumatic children. He states that night-terrors, especially when frequent and accompanied by hallucinations, are often coexistent with and indicative of epilepsy; and further says, in his chapter on "Hysteria," that night-terrors, with or without definite hallucinations described by the patient, are very common in hysterical children, but that they also occur occasionally in almost any child as the result of undue excitement and various kinds of nervous disturbance. Henoch says he has seldom seen them in connection with either hysteria or epilepsy. In fact, it would be hard to find any single complaint about which there is so much discussion among authorities as night-terrors. This was well emphasized in a discussion on an interesting paper on the subject by Dr. W. S. Colman,[23] at which I was present. Here no speaker seemed to agree with his predecessor as to their importance or causation.

All these conflicting opinions as to the causation of night-terrors may be summed up, it seems to me, under two comprehensive groups. In the first group may be classed the opinions that the complaint is reflex

in its origin or due to partial asphyxia owing to abdominal disturbance, naso-pharyngeal trouble, or ill-ventilation of the sleeping-apartment. In the second group may be classed the views that night-terrors are central in origin and manifestations of present brain-disturbance, and the harbingers of possible further neuroses in the near or distant future.

Keeping these two sets of opinions under consideration, I think it can be shown that the holders of them have arrived at their widely differing views of the causation and importance of night-terrors from a confusion between conditions that manifest themselves by symptoms that, at first sight, bear a close resemblance to each other. Closer examination, however, should, I consider, reveal the fact that the only thing really common to these two sets of conditions, which are widely different in their gravity, is the occurrence of fright in the early hours of the night. For this confusion I fancy the name "night-terrors" is largely or wholly responsible. Just as in the case of anterior poliomyelitis the name of "infantile paralysis" has led to numerous cases of hemiplegia and other infantile motor troubles being grouped under its denomination, so with night-terrors the name has led to complaints with nothing in common except the presence of a night-time panic being classified in the same category. Now there are, in my experience, two totally different classes of cases with the common symptom of terror arising during sleep. In the first class come cases which are fairly frequent and of little import, where the terror is reflex and due to abdominal or nasal trouble. In the second class come cases of comparative infrequency, where the malady arises from central cerebral disturbance, and is to be regarded with gravity as to both the present and the future of the patient. For the first class of cases, where the complaint is of reflex origin, I would suggest the familiar name of "nightmare," reserving that of "night-terrors" for the second class, where the malady is central in origin. Such an appropriation of names is, of course, purely arbitrary, and the two might be interchanged with equal propriety; but the name "night-terrors" has now gained a firm footing in medical nomenclature, and it seems to me fitting to reserve it for the class of cases that alone deserve a separate name and description. There is authority, too, for this naming a complaint after its most prominent symptom, in the retention of such titles as infantile paralysis in classes of cases with definite and sure pathological bases. Beyond doubt a better title could be given to the malady than the one in vogue, but names once given are hard to displace. For the selection of that of "nightmare" in the commoner and less important complaint, I feel justified in that it is the one generally bestowed on the symptom by the public at large.

This division of the subject that I propose has already, I fancy, been done by Silbermann. That author's classification of night-terrors into those that are "idiopathic" and others that are symptomatic in origin

would seem to correspond with my own, if I read him aright. Here his "idiopathic" class corresponds with my "night-terrors," his "symptomatic" one with my "nightmare."

As a cardinal point of distinction between the two complaints, I would insist that in night-terrors it is essential that the little patient should "see visions;" in nightmare it is sufficient that he merely "dream dreams." There are many other points of distinction, but, in attempting a discrimination between them, the last mentioned is a fundamental one. Unfortunately, it is but seldom an opportunity is afforded one of personally witnessing an attack, and an opinion has to be formed on the evidence, more or less untrustworthy, furnished by the relatives or friends. Nevertheless, attention to the following details generally leads one to a correct conclusion as to with which of the two complaints one has to deal.

Night-terrors seldom occur in children under the age of two or above that of eight years. Nearly all writers who attach any gravity to the complaint bearing this name are agreed on this. In nightmare there are no such limits of age, and many of us are personally acquainted with the states of panic arising from troubled dreams in adult age.

In a large percentage of cases of night-terrors there is a history of neuroses, such as epilepsy, hysteria, chorea, etc., in the other members of the family. There is no such neurotic family history in the vast majority of cases of nightmare, although it is common enough for more than one member of a family to suffer from it and adenoids at the same time.

Infantile convulsions, in my experience, are far from infrequent precursors of night-terrors in later age. There is no such relation between convulsions and subsequent nightmare that I have been able to discover.

In night-terror the attack generally comes on when the child is in the best of health, is quite sudden in its onset, and there is no indication afforded by which its advent is to be predicted. The children who suffer from nightmare are often the subjects of chronic ill-health from digestive disturbance or nasal troubles, and the attack is often merely the temporary termination of a sleep that, as Silbermann has pointed out, has been an uneasy one from the beginning. In the course of a night there is usually but a single attack of night-terrors, although there may be several of nightmare.

Turning from these preliminaries to the actual attack it is essential, as I have stated before, that the subject of night-terrors should see visions. The nature of these visionary hullucinations is one of interest, and generally presents several features of significance and importance. To illustrate this I will endeavor to describe briefly the usual sequence of events in a typical attack.

The first thing that calls attention to the child is almost invariably a sudden, agonizing scream of terror. On entering the room he is found, seemingly wide awake, sitting up in bed or crouching in a corner. With flushed face, and in a state of wild excitement, he converses with, or vehemently protests against, some imaginary person or thing that he sees close to him. The vision is always something of a threatening or terrifying nature, such as a horrible negro, a black statue, and the like. I have been much struck, too, with the large part the color red plays in these hallucinations, and Gowers has pointed out the same fact in the visual auras of epilepsy, and soldiers, blood, and fire figure prominently in the accounts furnished to me by parents. Whatever be the nature of the vision, it is repeated again and again in exactly the same features in each attack, even after the passage of months in the interval between them. Although seemingly wide awake in the attack, the child cannot be made sensible of his surroundings, and generally after being laid down goes off into a deep sleep without recognizing those about him. In the morning he has usually no recollection of what occurred during his sleep. Care has to be exercised in ascertaining this point, as children are apt to appropriate as their own experience occurrences that are often talked of before them, and are ready to detail them with parrot-like precision when questioned.

It is not, of course, essential that all these characteristics should be present before determining as to whether a given attack was one of night-terrors or not. I have, however, thought it well to give in detail the lines that are useful for guidance in this direction.

Contrasting nightmare with night-terrors, I think important differences are not hard to find. In the former the sleep is often disturbed from the outset, and the attack is merely a culmination of the state of unrest. On going to the child on his crying out, he is found wide awake, and not merely seemingly so. He generally complains of some vague terror, the result of his awaking alone in the dark. If he complain of persons or things being in the room, it will be found that his fancies are merely the remnants of a troubled dream, and he does not see them in the presence of a light. The objects of apprehension, too, are generally such as he has come across in his waking moments. It is perfectly common for a child that has been terrified by a person or some animal in the daytime to have such terrors repeated in his dreams at night. In contradistinction to night-terrors, the same objects of dread are not presented with unchanging fidelity, but may vary with each separate attack. Although the child may be almost demented from extreme terror, and it may take some time to soothe him from it, yet he is from the first aware of the presence of those in the room with him. When his fears are allayed, he so dreads the return of them that hours of wakefulness may be the result of the attack. In the morning he has usually a perfect recollection of the occurrences of the night.

Such are briefly the lines of contrast between two distinct complaints that I believe have been too often confounded. The one, "nightmare," is of common occurrence and of little moment in itself, but often associated with chronic ill-health in its subject. The other, "night-terrors," is rare and of gravity with regard to neuroses in the future.

The similarity of the phenomena presented in what I have described as a typical attack of "night-terrors" to those that take place in one of the well-recognized forms of epilepsy is not to be gainsaid. The recurrence of the same hallucinations, even after long intervals of time, the nature of the visions, the non-recognition of surroundings, and the non-recollection of what has been gone through, are features common to both. Dr. Hilton Fagge, who groups night-terrors with epilepsy, indeed suggests the name of "daymare" for the form of epilepsy in question. Considerations such as these should merely engender caution in a venture on the prognosis as to the future of a patient with night-terrors. Dr. Angel Money, indeed, unhesitatingly calls these last a form of "cortical epilepsy." On the other hand, Dr. W. S. Colman only considers them as an epileptic manifestation when the attacks are continued on into adult life—a contingency that is not within my experience—although Dr. Coleman has known more than one instance of it. Dr. H. C. Wood says "Night-terrors are not rarely the precursors of epilepsy." Soltmann, too, writes that they are observed to pass into epilepsy, and that there are cases in which it is impossible to say whether a given attack is one of night-terrors or epilepsy. Moizard quotes several cases where epilepsy followed night-terrors. Lyman says "Insanity, hysteria, neurasthenia, epilepsy, chorea, and nervous dyspepsia are often discovered among their near relatives." My own experience fully tallies with that of the authors just quoted. I have known more than one case where epilepsy followed upon night-terrors, and I can hardly recall a case where there was not a pronounced neurotic taint in the family history of the sufferer from them. Dr. Charles Putnam, however, is inclined to think too much stress has been laid upon the connection between night-terrors and epilepsy. It is quite true, as he remarks, that the published cases where the one has followed the other are few in number. This possibly arises from the fact that those who have recognized the gravity of night-terrors may have had but seldom the opportunity of following up the after-history of their patients. As a proof of this I would mention that in several cases brought to me for epilepsy I have been able to verify the former existence of night-terrors. This was only brought out by inquiry, as the last complaint was deemed of so little moment that the mothers did not consider it worthy of mention in the previous histories. I have no reason either to think that my experience in this matter would be at variance with that of others with large numbers of cases of epilepsy in children to deal with, if such inquiries were considered worthy of being made.

Epilepsy is not, however, the only, and perhaps not even the most frequent, sequel to night-terrors in children. An attack of the last is only the loud proclaimant of the neurotic temperament in its subject, and there is no doubt that other neuroses, such as hysteria, chorea, migraine, insanity, somnambulism, and the like, play a large part in the after-histories as well as epilepsy. Somnambulism and somniloquence, indeed, are very close and frequent attendants on the complaint, and have been often noted in cases where epilepsy has eventually followed.

The treatment of night-terrors calls for but few remarks. When the attacks are frequent and they cause distress to the relatives, I agree with the common practice of giving appropriate doses of bromide of potash. By this means, and more especially when the drug is given in the evening, the attacks can be largely held under control. If, however, the attacks are infrequent, and there is no other indication for the administration of bromide, I consider a prolonged course of the last inadvisable and possibly harmful. With the following words of Dr. Goodhart I heartily concur: "It (night-terrors) is a malady of little detriment in itself; but as an indication of a nervous organization it is most valuable. It is the 'slacken speed' to the engine-driver which must never pass unheeded. It is one of the smaller ailments I am always most careful to inquire for and to treat, for it is my belief that by so doing it may be possible to avert some one or other of the graver nervous maladies so common in later life."

Strict attention to the child's surroundings and a careful supervision of its training to obviate as far as possible any undue mental or nervous stress in reality constitute the essentials of treatment in night-terrors.

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THE INFLUENCE OF ALCOHOL AND ALCOHOLIC DRINKS UPON THE CHEMICAL PROCESSES OF DIGESTION.[1]

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(Continued from p. 59.)

Action of Wines.

In considering the action of wines on gastric digestion it is to be remembered that we have to deal with a class of beverages which naturally contain far less alcohol than the liquors already discussed. The prominence which they have as accessories to food, however, and the relatively larger quantities in which they are consumed lend special importance from a physiological standpoint to a study of their action. Further, the greater complexity of wines in chemical composition naturally introduces a variety of factors, aside from the alcohol, which necessarily merit some consideration. It is likewise to be remembered that while wines are supposed to consist simply of pure grape-juice fermented and clarified, there is a large manufacture of artificial wines, both in Europe and in this country, in which "raisins, cider, sugar, alcohol, glycerin, tartaric acid, cream of tartar, coloring-matter, wine-flavors, and water" are the principal substances used.[1]

With special reference to the content of alcohol we may divide wines into the two classes of heavy and light—*i. e.*, those which contain a comparatively large percentage of alcohol, as sherry and port, and those which contain a smaller amount of alcohol, such as clarets and hocks. With reference to the many grades of California wines which are being so widely used at present in this country, we may refer to a recent report on their chemical composition and characteristics by Dr. King.[2]

Sherry.

Our experiments were commenced with a brand of sherry sold as "Amontillado Sherry," at 75 cents per quart. Its composition was found to be as follows:

Specific gravity	0.997 (at 17.5° C.).
Alcohol by volume	20.75–21.75 per cent.
Solid residue at 110° C. . . .	4.7338 grams per 100 c.c.
Ash	0.4154 gram " "
Reaction acid.	

[1] See report by Dr. Englehardt in the Second Annual Report of the State Board of Health of New York, p. 619.

[2] "Some Characteristics of California Wines," by W. H. King, of the Chemical Laboratory of the U. S. Department of Agriculture. Journal of Amer. Chem. Soc., vol. xvi. p. 597.

Experiment 49.

Conditions:

Proteid = cooked beef proteids[1] (10 grams).
10 grams beef contain 4.3262 grams dry proteid.
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $7\frac{1}{6}$ hours at 38°–40° C.

Sherry.	Undigested beef.	Proteid digested.	Relative proteolytic action.
0 per cent.	1.9810 grams.	54.3 per cent.	100.0
1 "	2.0839 "	51.9 "	95.5
3 "	2.0995 "	51.5 "	94.8
6 "	2.1102 "	51.3 "	94.4

Experiment 50.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $2\frac{3}{4}$ hours at 38°–40° C.

Sherry.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3646 gram.	81.8 per cent.	100.0
1 "	0.3555 "	82.3 "	100.6
3 "	0.4075 "	79.7 "	97.4
6 "	0.4213 "	79.0 "	96.5

Experiment 51.

Conditions:

Proteid = fluid egg-albumin (15 c.c.).
15 c.c. albumin solution contain 1.0522 grams dry albumin.
0.0024 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $5\frac{3}{4}$ hours at 38°–40° C.

Sherry.	Undigested albumin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.4547 gram.	56.8 per cent.	100.0
1 "	0.5072 "	51.8 "	91.1
3 "	0.5101 "	51.6 "	90.8
5 "	0.5806 "	44.9 "	79.0
7 "	0.5916 "	43.8 "	77.1
Sherry residue.[2]			
1 per cent.	0.4912 "	53.4 "	94.0
7 "	0.5482 "	47.9 "	84.3

Experiment 52.

Conditions:

Proteid = fluid egg-albumin (15 c.c.).
15 c.c. albumin solution contain 1.1948 grams dry albumin.
0.0024 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $5\frac{1}{2}$ hours at 38°–40° C.

[1] Washed free from all soluble matters and freed from fat.

[2] The residue left on evaporation of the sherry. This was then dissolved in water and introduced into the digestive mixtures, the percentages referred to being the amount of residue contained in 1 per cent. and 7 per cent. of the original sherry, respectively.

Sherry.	Undigested albumin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.6503 gram.	45.6 per cent.	100.0
1 "	0.6578 "	45.0 "	98.6
3 "	0.6930 "	42.0 "	92.1
6 "	0.7533 "	37.0 "	81.1
Sherry residue.			
1 per cent.	0.6728 "	43.7 "	95.8
6 "	0.6560 "	45.1 "	98.9

Experiment 53.

The conditions were the same as in the preceding experiment, excepting that the period of digestion was $6\frac{5}{12}$ hours.

Sherry.	Undigested albumin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.6617 gram.	44.7 per cent.	100.0
1 "	0.6864 "	42.6 "	95.3
3 "	0.7304 "	38.9 "	87.0
6 "	0.7368 "	38.4 "	85.9
Sherry residue.			
1 per cent.	0.6839 "	42.8 "	95.7
3 "	0.6810 "	43.1 "	96.4
6 "	0.6314 "	47.2 "	105 5

Experiment 54.

Conditions:

Proteid = blood-fibrin (2 grams).

0.016 gram pepsin; 0.2 per cent. hydrochloric acid.

Period of digestion 2½ hours at 38°–40° C.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2013 gram.	90.0 per cent.	100.0
5 " absol. alcoh.	0.2601 "	87.0 "	96.6
5 " sherry	0.3401 "	84.8 "	94.2

From these results it is plain that while sherry wine has a marked retarding effect on gastric digestion—an effect which increases with the weakness of the gastric juice—the inhibitory action is out of all proportion to the amount of contained alcohol. Thus, 10 per cent. of the sherry used in these experiments would be equivalent simply to 2 per cent. of absolute alcohol, an amount which, as we have seen, is wholly inadequate to bring about the retardation in proteolysis observed with sherry. Indeed, 2 per cent. of alcohol is more liable to be without any marked influence on pepsin-proteolysis. The presence of 5 per cent. of sherry, however, as our last experiment shows, has a far greater retarding effect than even 5 per cent. of absolute alcohol. It is thus evident that we must look elsewhere for an explanation of the action of sherry wine on gastric digestion. Buchner,[1] in his investigations of the

[1] Deutsches Archiv f. klin. Med., Band 29, p. 537.

influence of alcoholic liquors on peptic digestion, found that the light white and red French wines retarded digestion far more than corresponding quantities of alcohol. Similar results were obtained with the stronger Hungarian wines (Ruster and Tokayer). Especially unfavorable was the action of Marsala wine. Buchner attributed these results to the presence of the "*bouquet stoffe*." It is evident, however, from our results that with sherry regard must be had to the residue or solid matter contained in the wine. This, as our analysis shows, is present in the wine to the extent of approximately 4.75 per cent., the greater proportion of which is organic matter. Further, it is evident that this solid matter, when free from the alcohol of the wine, has by itself a distinct influence on peptic digestion. So far as our experiments show, small amounts of this solid matter retard peptic digestion more than larger quantities. Indeed, in one case the solid matter equivalent to 6 per cent. of sherry increased the digestive action of the artificial gastric juice quite appreciably. Evidently there are various factors of unknown nature in this residue which exert an influence, not always constant, upon the rate of digestive proteolysis by pepsin-hydrochloric acid.

The following experiments throw some additional light upon this subject:

Experiment 55.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion 2½ hours at 38°–40° C.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2027 gram.	89.9 per cent.	100.0
5 " sherry	0.2340 "	88.3 "	98.2
5 " " residue	0.2627 "	86.9 "	96.6
5 " absol. alcoh.	0.2619 "	87.0 "	96.7

Experiment 56.

Conditions the same as in the preceding experiment, except that the mixtures were warmed at 38°–40° C. for $1\frac{7}{12}$ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3247 gram.	83.8 per cent.	100.0
5 " absol. alcoh.	0.3554 "	82.3 "	98.2
10 " sherry	0.4785 "	76.1 "	90.8
10 " " distillate[1]	0.2855 "	85 8 "	102.3
10 " " residue	0.4453 "	77.8 "	92 8

[1] Being the distillate from this amount of sherry and containing obviously all of the alcohol together with the other volatile substances present therein.

It is thus evident that so far as the alcohol and other volatile substances present in sherry are concerned, the amount introduced into an artificial gastric juice with 10 per cent. of sherry (*i. e.*, 10 c.c.) tends to increase quite distinctly the rate of digestion. Hence, the substance or substances which give the bouquet to this wine are probably not the cause of the retardation in digestive action, but this is to be traced directly and solely to the substance or substances which make up the solid matter of the wine. Obviously, however, if sherry be mixed with gastric juice in such quantity as to introduce 5, 10, or 15 per cent. of absolute alcohol the latter will produce its ordinary retardation of proteolytic action, although doubtless lessened somewhat by the bouquet or other volatile material which apparently stimulates rather than retards peptic digestion.

Our results are thus more or less in accord with the results obtained by Sir William Roberts,[1] who in writing of the effects of sherry and port on gastric digestion says, "It is evident that the retarding effects of sherry and port considerably exceed what is due to the alcohol contained in them. The table shows that when the digesting mixture contained 40 per cent. of either wine the action of the ferment was brought almost to a standstill. These wines are estimated to contain about 20 per cent. of absolute alcohol (or 40 per cent. of proof-spirit); therefore, 40 per cent. of these wines is only equivalent in alcoholic strength to 16 per cent. of proof-spirit—and this proportion of alcohol retards digestion only slightly. Even in the proportion of 20 per cent., sherry trebled the time in which digestion was completed. There must, therefore, be in these wines some retarding agent besides alcohol."

We may quote Dr. Roberts still further in this connection, since his statements express so clearly our own conclusions based upon the results we have obtained: "As used dietetically, sherry must figure as having frequently an important retarding effect on peptic digestion. This wine is used with dinner by some persons very freely. Half a pint of sherry is no unusual allowance, and this in a total gastric charge of two pounds amounts to about 25 per cent., which the table shows to be a highly inhibitory proportion. In the more common practice of taking two or three wineglasses of sherry with dinner, we see probably a double action —a stimulating action on the secretion of gastric juice and on the muscular contractions of the stomach, and a slight retarding effect on the speed of the chemical process, especially in its early stages. In smaller proportions—a wineglass or so—sherry would act as a pure stimulant to digestion." On the purely chemical process of gastric digestion, however, we should be inclined, from the results of our own experiments, to insist that even small amounts of sherry may exert a slight inhibitory action. As to the cause of the retarding action of sherry, Roberts con-

[1] Digestion and Diet: "Effect of Food Accessories on Peptic Digestion," London, 1891, p. 134.

siders it due largely to the volatile constituents of the wine other than the alcohol, while our experiments would lead us to believe that it is attributable mainly to the character of the solid matter contained therein.

Claret.

Our experiments with claret were conducted solely with a California wine of ordinary grade, known as "Chateau Roland, Bordeaux," sold at 30 cents a quart. Its composition was as follows:

Specific gravity	1.000 (at 20° C.).
Alcohol by volume	9.75–10.0 per cent.
Solid residue at 110° C. . . .	3.3056 grams per 100 c.c.
Ash	0.6336 gram " "
Reaction strongly acid.	

That this was a typical sample of a California wine of the claret type, at least so far as the content of alcohol is concerned, is indicated by the fact that King[1] states in his paper on the "Characteristics of California Wines" that California clarets contain 9.16–11.23 per cent. of alcohol.

Experiment 57.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $2\frac{5}{12}$ hours at 38°–40° C.

Claret.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3401 gram.	83.0 per cent.	100.0
1 "	0.3252 "	83.8 "	100.9
3 "	0.3965 "	80.2 "	96.6
6 "	0.3732 "	81.4 "	98.0

Experiment 58.

Conditions:

Proteid = fluid egg-albumin (15 c.c.).
15 c c. albumin solution contain 1.347 grams dry albumin.
0.04 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion 7 hours at 38°–40° C.

Claret.	Undigested albumin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5800 gram.	57.0 per cent.	100.0
1 "	0.5313 "	60.6 "	106.3
3 "	0.5899 "	56.3 "	98.7
6 "	0.5892 "	56.3 "	98.7
Claret residue.[2]			
1 per cent.	0.5865 "	56.5 "	99.1
3 "	0.5253 "	61.0 "	107.0
6 "	0.5903 "	56.2 "	98.5

[1] Loc. cit.

[2] The residue left on evaporation of the claret. The several percentages refer to the original claret, *i.e.*, the 1 per cent. claret residue being the residue from 1 per cent. of claret.

Experiment 59.

Conditions:

Proteid = fluid egg-albumin (15 c.c.).
15 c.c. albumin solution contain 1.1948 grams dry albumin.
0.0024 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $5\frac{1}{2}$ hours at 38°–40° C.

Claret.	Undigested albumin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.6808 gram.	43.2 per cent.	100.0
1 "	0.6801 "	43.2 "	100.0
3 "	0.6950 "	41.9 "	96.9
5 "	0.7258 "	39.3 "	90.9
7 "	0.7238 "	39.5 "	91.2
Claret residue.			
1 per cent.	0.6546 "	45.3 "	104.8
3 "	0.6785 "	43.3 "	100.2
7 "	0.6847 "	42.7 "	98.8

Experiment 60.

Conditions:

Proteid = fluid egg-albumin (15 c.c.).
15 c.c. albumin solution contain 1.347 grams dry albumin.
0.0024 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $6\frac{1}{4}$ hours at 38°–40° C.

Claret.	Undigested albumin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.7659 gram.	43.2 per cent.	100.0
1 "	0.7839 "	41.9 "	96.9
3 "	0.7980 "	40.8 "	94.4
6 "	0.8161 "	39.5 "	91.2
Claret residue.			
1 per cent.	0.7589 "	43.7 "	101.1
6 "	0.7644 "	43.2 "	100.0

Experiment 61.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $2\frac{1}{4}$ hours at 38°–40° C.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2013 gram.	90.0 per cent.	100.0
5 " absol. alcoh.	0.2601 "	87.0 "	96.6
5 " claret	0.2560 "	87.2 "	96.8

Experiment 62.

Conditions exactly the same as in the preceding experiment.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.1759 gram.	91.3 per cent.	100.0
5 " absol. alcoh.	0.2145 "	89.3 "	97.8
5 " claret residue	0.2214 "	89.0 "	97.4

From a careful scrutiny of these results several conclusions are obvious: First, the presence of small amounts of claret, say 1 per cent., in a digestive mixture tends to increase rather than to decrease digestive action. Large amounts of claret have a distinct inhibitory action on pepsin-proteolysis, which, however, is not anywhere near so pronounced as with sherry. To be sure, the content of alcohol in the claret is only half that of the sherry, but even 6 per cent. of claret is equal to only 0.6 per cent. of absolute alcohol. Yet the retardation produced by the presence of 5 per cent. of claret is about equivalent to that caused by 5 per cent. of absolute alcohol. Consequently, the retardation in gastric digestion witnessed in the presence of the above percentages of claret is hardly to be attributed to the contained alcohol.

With the solid matter present in claret our results are not strictly concordant; thus, some of our experiments tend to show that the solid matter present in this wine has a direct stimulating effect, while in other experiments the retardation produced by the solid matter of the wine is exactly equal to that of the wine itself. We have not been able to come to any satisfactory conclusion on this point, the only plausible suggestion that we have to offer being that possibly the difficulty lies in the variable character of the coloring and other matters present in the wine. In any event, the alcohol present in this wine is answerable for its action on gastric digestion only to a very limited extent. Again, we find our results in close accord with those obtained by Roberts. Thus, this investigator states that the effect of both claret and hock is out of all proportion to the alcohol contained in them: "These wines are estimated to contain from 10 to 20 per cent. of absolute alcohol, so that, however freely they might be used dietetically, the amount of alcohol so introduced, even if they were used up to 80 per cent. of the total contents of the stomach, would scarcely produce an appreciable effect on peptic action. We must, therefore, again here recognize the presence of some other retarding agent besides alcohol.

"If we consider the copious proportions in which hock and claret are used dietetically, it becomes evident that their retarding effect on peptic digestion is often brought into play. A pint of claret or hock is a common allowance with dinner for robust eaters—and such a proportion as the table shows would not be without considerable effect. . . . On the other hand, the more sparing use of these wines, a glass or two, with dinner or luncheon would evidently not produce any appreciable retardation of peptic action, but would, like corresponding doses of sherry, act as pure stimulants. In both these instances, as in some others, it seems to be indicated that by adjusting the quantities we may elicit diverse effects. With large quantities we may obtain retardation; with small

quantities we may obtain acceleration of gastric digestion."[1] With these statements our results are mainly in accord.

White Wine of the Rhenish Type.

In our study of this kind of wine we employed a California wine sold under the name of "Hochheimer" at 35 cents per quart. Our analysis of the brand employed gave the following results:

Specific gravity	0.997 (at 17° C.).
Alcohol by volume	11.0 per cent.
Solid residue at 110° C.	1.8436 grams per 100 c.c.
Ash	0.2236 gram " "
Reaction acid.	

The wines of this type, as King states, are characterized by a content of alcohol varying from 8.45 to 11.67 per cent., and with an acidity equal to 0.50 to 0.65 per cent. of tartaric acid.

Experiment 63.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion 1½ hours at 38°–40° C.

White wine.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2829 gram.	85.9 per cent.	100.0
1 "	0.2716 "	86.5 "	100.6
3 "	0.3122 "	84.4 "	98.2
6 "	0.3464 "	82.7 "	96.2

Experiment 64.

Conditions same as above, but the period of digestion 2¼ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2013 gram.	90.0 per cent.	100.0
5 " wine	0.2439 "	87.9 "	97.6
5 " absol. alcoh.	0.2601 "	87.0 "	96.6

Experiment 65.

Conditions the same as in the preceding experiment.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.1759 gram.	91.3 per cent.	100.0
5 " absol. alcoh.	0.2145 "	89 3 "	97.8
5 " wine residue	0.2158 "	89.3 "	97.8

[1] Roberts: Digestion and Diet, p. 136.

Experiment 66.

Conditions same as above, but the period of digestion $1\frac{3}{4}$ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2032 gram.	89.9 per cent.	100.0
5 " absol. alcoh.	0.2317 "	88.5 "	98.4
10 " wine	0.2531 "	87.4 "	97.2
10 " " distillate[1]	0.2063 "	89.7 "	99.7
10 " " residue	0.2810 "	86.0 "	95.6

From these results it is obvious that essentially the same conclusions can be drawn with regard to this white wine as have been applied to claret. A small quantity, such as 1 per cent., has no retarding action on pepsin-proteolysis, but tends rather to increase the rate of digestion. Larger amounts of the wine, say 10 per cent., have a small retarding effect, which is due almost wholly to the solid matter present in the wine rather than to the alcohol or other volatile matter. Thus, the distillate (Experiment 66) corresponding to 10 per cent. of the original wine had almost no retarding action on gastric digestion, while the residue from the same amount of wine caused a retardation even greater than that produced by the wine itself. At the same time, it is to be noticed that the white wine is far less active in retarding pepsin-proteolysis than the red wine. This difference in intensity of action depends probably upon the character of the solid matter present in the wine, or possibly upon the amount of such matter; the claret containing 3.3056 grams of solid matter per 100 c.c., while the white wine contained only 1.8436 grams per 100 c.c. Doubtless, however, differences in the methods of treating the grape in the manufacture of the wine, the processes of plastering and mixing, as well as the variations the artistic mixer of wines may introduce, all have an influence in determining the character of this solid residue, which seems far more potent than the alcohol in acting upon the digestive process.

Hence, we may conclude that wines as a class, taken in small amount, have little or no deleterious influence upon the chemical processes of gastric digestion. In small amounts they may even increase somewhat the rate of digestive action owing to the alcohol, and perhaps other substances, contained in them. In larger quantities they have more or less of a retarding effect upon gastric digestion; an effect which is dependent rather upon the character and amount of the solid matter present in the fluid than upon the contained alcohol, bouquet-flavoring, or other volatile material. Indeed, wines differ most markedly from liquors of the brandy and whiskey type, in that their action upon gastric digestion is not at all proportional to their content of alcohol. As we have seen,

[1] Being the volatile matter, alcohol, etc., obtainable from an amount of wine equivalent to 10 per cent. of the original hochheimer.

whiskeys, brandies, etc., owe their action upon pepsin-proteolysis almost wholly to the contained alcohol, while in wines, say with 10 per cent. of alcohol, the alcohol is of minor importance so far as the influence of the fluid upon the solvent or digestive power of the gastric juice is concerned.

Direct Comparison of the Action of Some of the Foregoing Liquors.

The comparative action of the alcoholic fluids thus far studied has perhaps been made sufficiently clear, but inasmuch as the conditions under which proteolysis occurs have such an important bearing upon the rate of digestion, we have deemed it wise to make an experiment with representatives of the different liquors in which all of the attendant conditions should be identical. The results are shown in the following experiment:

Experiment 67.

Conditions:

Proteid = blood-fibrin (2 grams).

0.016 gram pepsin; 0.2 per cent. hydrochloric acid.

Period of digestion 2¼ hours at 38°–40° C.

Fluid used, 5 per cent.	Alcoholic strength.[1]	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0	0	0.2013 gram.	90.0 per cent.	100.0
Absol. alcoh.	99.5 per cent.	0.2601 "	87.0 "	96.6
Rum	51.0 "	0.2304 "	88.5 "	98.3
Whiskey	50.5 "	0.2312 "	88.5 "	98.3
Brandy	47.5 "	0.2251 "	88.8 "	98.7
Sherry	21.0 "	0.3041 "	84.8 "	94.2
Hochheimer	11 0 "	0.2439 "	87.9 "	97.6
Claret	10.0 "	0.2560 "	87.2 "	96.8

These results, obtained under exactly similar conditions, are suggestive in that they show so clearly the relative retarding action of these several alcoholic fluids. Sherry, with its high content of solid matter (about 4.75 per cent.), shows the greatest retarding action, while claret and absolute alcohol come next, followed by the hochheimer. Rum, whiskey, and brandy, with the highest content of alcohol, produce the least effect, in harmony with the preceding experiments, so that we again have evidence of the greater retarding effect of the solid matters contained in wines. Alcohol plainly reduces the rate of pepsin-proteolysis, but 5 per cent. of pure absolute alcohol has no greater retarding action than the same percentage of claret with only one-tenth as much absolute alcohol. Again, rum, whiskey, and brandy cause approximately only half the retardation that the same percentage of claret will produce, although the latter contains only one-fifth as much absolute alcohol.

[1] Being the content of alcohol in the fluid added.

Action of Malt Liquors.

Under this term are included a large variety of beverages, such as beers, ales, porter, stout, etc., all of which are supposed to contain only a comparatively small amount of alcohol, with a relatively large amount of extractive matter. "The composition of malt liquors varies greatly according to the materials used, the method of brewing, the season, and the use for which it is intended. . . . The chemical composition is very complex, the principal constituents being alcohol, various sugars, and carbohydrates, nitrogenous matter, carbonic, acetic, succinic, lactic, malic, and tannic acids, bitter and resinous extractive materials from the hops, glycerin, and various mineral constituents, consisting mainly of phosphates of the alkalies and alkali earths."[1]

The following table shows the maximum and minimum content of alcohol, extract, and ash in 476 samples obtained in American markets:[2]

Kind.	Maximum.			Minimum.		
	Alcohol by weight.	Extract.	Ash.	Alcohol by weight.	Extract.	Ash.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Lager	7.061	9.647	0.412	0.677	3.655	0.172
Ale	8.994	9.501	0.552	2.410	2.703	0.197
Porter	6.695	11.783	0.557	1.671	2.843	0.170
Weiss	3.179	4.143	0.486	0.755	1.277	0.069

A recent examination[3] of Munich beer made in the analytical laboratory of the London *Lancet*, with which the composition of English beer has been contrasted, gave the following results:

	Munich beer. Löwenbrau.	English beers. Mild.	Bitter.
Alcohol by weight	3.55 per cent.	6.78 per cent.	5.44 per cent.
Alcohol by volume	4.45 "	8.45 "	6.78 "
Equal to proof-spirit	7.80 "	14.81 "	11.89 "
Total malt extractives	7 09 "	6.74 "	5.42 "
Mineral matters	0.36 "	0.43 "	0.24 "
Albuminous matters	0 57 "	0 26 "	0.16 "
Maltose and dextrin	6.15 "	5.77 "	4.22 "

Toledo Lager Beer.

A partial analysis of this beer gave us the following results:

Specific gravity	1.019 (at 17.5° C.).
Alcohol by volume	2.75 per cent.
Extract	5.9856 grams per 100 c.c.
Ash	0.1820 gram " "

[1] Bulletin 13, part 3, p. 275, U. S. Department of Agriculture, Division of Chemistry.
[2] Ibid., p. 279.
[3] London Lancet, February 16, 1895.

Experiment 68.

Conditions:

Proteid = fluid egg-albumin (15 c.c.).
15 c.c. of the albumin solution contain 1.3395 grams dry albumin.
0.006 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion 7 hours at 38°–40° C.

Beer.	Undigested albumin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.4121 gram.	69.3 per cent.	100.0
1 "	0.4110 "	69.4 "	100.1
3 "	0.4347 "	67.6 "	97.5
5 "	0.4314 "	67.8 "	97.8
7 "	0.5183 "	61.4 "	88.6
Beer residue.			
1 per cent.	0.4042 "	69.9 "	100.9
7 "	0.4546 "	66.1 "	95.3

Milwaukee Bock Beer.

This sample of beer, "Milwaukee Lager Beer, Pabst's Bock," had the following composition:

Specific gravity	1.017 (at 17.5° C.).
Alcohol by volume	2.5 per cent.
Extract	2.6479 grams per 100 c.c.
Ash	0.1462 gram " "

Experiment 69.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion 1½ hours at 38°–40° C.

Beer.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2829 gram.	85.9 per cent.	100.0
1 "	0.2738 "	86.4 "	100.5
3 "	0.3085 "	84.6 "	98.4
6 "	0.3183 "	84.1 "	97.9
Beer residue.			
6 per cent.	0.3079 "	84.6 "	98.4

New Haven Lager Beer.

This beer gave on analysis the following results:

Specific gravity	1.026 (at 18° C.).
Alcohol by volume	1 5 per cent.
Extract	7.1236 grams per 100 c.c.
Ash	0.2192 gram " "

Experiment 70.

Conditions:

Proteid = cooked and washed beef proteid (10 grams moist).
10 grams beef proteid contain 4.3262 grams dry proteid.
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $7\frac{1}{8}$ hours at 38°–40° C.

Beer.	Undigested proteid.	Proteid digested.	Relative proteolytic action.
0 per cent.	1.9810 grams.	54.3 per cent.	100.0
1 "	1.9513 "	54.9 "	101.1
3 "	2.0189 "	53.4 "	98.3

Experiment 71.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $2\frac{3}{4}$ hours at 38°–40° C.

Beer.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3646 gram.	81.8 per cent.	100.0
3 "	0.3591 "	82.1 "	100.3
6 "	0.3961 "	80.2 "	98 0

Experiment 72.

Conditions the same as in the preceding experiment, except that the period of digestion was $2\frac{1}{2}$ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.4630 gram.	76.9 per cent.	100.0
2 " absol. alcoh.	0.4583 "	77.1 "	100.2
10 " beer	0.5218 "	74.0 "	96.2
10 " " residue	0.5134 "	74 4 "	96.7
10 " " distillate	0.4127 "	79.4 "	103.2

From these experiments with beer containing a low content of alcohol, it is seen that the tendency is toward a slight retardation of proteolysis. The extent of retardation with a given percentage of beer is dependent, however, upon the digestive strength of the gastric juice. Where digestive action is fairly strong, retardation with, say, 10 per cent. of beer is very slight, and if we are to trust the result of Experiment 72 the inhibitory action is to be connected mainly with the extractive matters present in the beer rather than with the alcohol. Indeed, the amount of alcohol in these beers is altogether too small to have any appreciable retarding action upon the chemical processes of gastric digestion unless the beverage is consumed in very large quantity.

Especially noticeable is the constant, though slight, stimulation of proteolysis caused by a small percentage of beer.

According to Roberts, beer, when "well up," is distinctly more favorable to quick digestion than the same beer when "flat." This effect, he adds, is probably due to the mechanical effect of the escaping gas in stirring up the mixture.

Ale.

The ale used in the following experiments was "Burton Pale Ale," Bass & Co.'s Extra. A partial analysis of one sample gave the following results:

Specific gravity	1.014 (at 20° C.).
Alcohol by volume	4.0 per cent.
Extract	4.4254 grams per 100 c.c.
Ash	0 3530 gram " "

In another sample the content of alcohol was 5.25 per cent.

Experiment 73.

Conditions:

Proteid = fluid egg-albumin (15 c.c.).
15 c.c. albumin solution contain 1.347 grams dry albumin.
0.0024 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $6\frac{5}{12}$ hours at 38°–40° C.

Ale.	Undigested albumin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.7861 gram.	41.7 per cent.	100.0
1 "	0.7908 "	41.3 "	99.0
3 "	0.7826 "	41.9 "	100.3
5 "	0.8304 "	38.4 "	92.0
7 "	0.8496 "	37.0 "	88.7
Ale residue.			
1 per cent.	0.7498 "	44.0 "	105.5
7 "	0.8094 "	40.0 "	95.9

Experiment 74.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion $2\frac{1}{2}$ hours at 38°–40° C.

Ale.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.4263 gram.	78.7 per cent.	100.0
1 "	0.4528 "	77.4 "	98.3
3 "	0.4636 "	76.9 "	97.7
6 "	0.5031 "	74.9 "	95.1

Experiment 75.

Conditions same as in the preceding experiment, except that the period of digestion was $1\frac{3}{4}$ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5068 gram.	74.7 per cent.	100.0
2 " absol. alcoh.	0.4970 "	75.2 "	100.6
10 " ale	0.7218 "	64.0 "	85.6
10 " " distillate	0.5302 "	73 5 "	98.3
10 " " residue[1]	0.6988 "	65.1 "	87.1
10 " " " [2]	0.7060 "	64.7 "	86.6

The results are essentially of the same order as those obtained with beer, although the ale appears to have a somewhat greater retarding action than lager beer.

Porter.

The porter used in our experiments was labelled "Feigenspan's," Newark, and had the following composition:

Specific gravity	1.011 (at 18.5° C.).
Alcohol by volume	3.75 per cent.
Extract	4.4470 grams per 100 c.c.
Ash	0.2586 gram " "

Experiment 76.

Conditions:

Proteid = blood-fibrin (2 grams).

0.016 gram pepsin; 0.2 per cent. hydrochloric acid.

Period of digestion $2\frac{5}{12}$ hours at 38°–40° C.

Porter.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3401 gram.	83.9 per cent.	100.0
1 "	0.4038 "	79.9 "	96.2
3 "	0.4226 "	78.9 "	95.0
6 "	0.4335 "	78.4 "	94 4

Experiment 77.

Conditions the same as in the preceding experiment, except that the period of digestion was $2\frac{1}{4}$ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3881 gram.	80.6 per cent.	100.0
4 " absol. alcoh.	0.4118 "	79.5 "	98.6
10 " porter	0.4208 "	79.0 "	98.0
10 " " distillate	0.3783 "	81.1 "	100.6
10 " " residue[3]	0.4480 "	77.6 "	96.2
10 " " " [4]	0.4447 "	77.8 "	96.5

Porter is thus seen to have about the same retarding action on pepsin-proteolysis as lager beer, although not showing the stimulation so char-

[1] Made up so as to contain 4 per cent. of alcohol.
[2] Dissolved in water.
[3] Made up to contain 4 per cent. of alcohol.
[4] Dissolved in water.

acteristic of small quantities of this latter fluid. Further, such retardation as is produced is associated mainly with the presence of the extractives rather than with the volatile matters present in the fluid.

Stout.

The stout used was "Guiness's Dublin Stout," with the following composition:

Specific gravity	1.013.
Alcohol by volume	5.5 per cent.
Extract	5.4220 grams per 100 c.c.
Ash	0.3612 gram " "

Experiment 78.

Conditions:

Proteid = blood-fibrin (2 grams).
0.016 gram pepsin; 0.2 per cent. hydrochloric acid.
Period of digestion 2½ hours at 38°–40° C.

Stout.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.4263 gram.	78.7 per cent.	100.0
1 "	0.4133 "	79.4 "	100.8
3 "	0.4440 "	77.8 "	98.8
6 "	0.4839 "	75.9 "	96.4

Experiment 79.

Conditions the same as in the preceding experiment, except that the period of digestion was 2 hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5315 gram.	73.5 per cent.	100.0
2 " absol. alcoh.	0.5390 "	73.1 "	99.4
10 " stout	0.6582 "	67.1 "	91.2
10 " " distillate	0.5317 "	73.5 "	100.0
10 " " residue[1]	0.6665 "	66.7 "	90.7
10 " " " [2]	0.6675 "	66.7 "	90.7

Here, again, we have essentially the same results as were obtained with lager beer and ale. With 10 per cent. of stout there is a distinct retardation of pepsin-proteolysis, perhaps even greater than with either of the other fluids of this class; a retardation, however, that is due almost wholly to the contained extractives rather than to the alcohol or other volatile matters. Thus, while the distillate from this liquor is entirely without action upon pepsin-proteolysis, the residue or extractive matter inhibits digestion to about the same extent as the beverage itself.

Taken collectively, our experiments with malt liquors tend to show that the retarding effect of these fluids is, as is the case with wines,

[1] Made up to contain 4 per cent. of alcohol.

[2] Dissolved in water.

altogether out of proportion to their content of alcohol. Containing, as a rule, not much more than 4 to 6 per cent. of alcohol, the latter, when consumed in the ordinary forms of malt liquors, can have very little influence upon the chemical processes of gastric digestion. When, however, these beverages are consumed very freely with the meals, so that the digesting mass in the stomach contains 50 or 60 per cent. of these fluids, one can easily see from the results reported that the retarding action upon the solvent or digestive power of the gastric juice must be very considerable, owing to the action of the extractives they contain. Taken in small quantities, on the other hand, these malt liquors are without any marked effect upon the proteolytic action of the gastric juice.

The inhibitory action of these fluids is to be compared with the inhibitory action of such beverages as tea and coffee, the retarding action of which is equally pronounced or even greater when the latter are consumed in large quantities. In this connection it seems no more than proper to add that the extractives or solid matters ordinarily present in malt liquors are not especially peculiar in possessing this retarding action upon pepsin-proteolysis. It is, indeed, a property shared by many substances, and does not in itself necessarily constitute an evil of any great magnitude unless the retardation is very pronounced and liable to be long continued. Then, indeed, it may become a serious evil, and one sufficient to condemn the substance which causes it.

Comparative Action of Some Alcoholic Liquors on Pepsin-proteolysis.

The following tables, the figures of which are taken from experiments already recorded, may serve to show the relative action of given percentages of the more common alcoholic liquors on the solvent power of the gastric juice, the results in each table having been obtained under exactly similar conditions:

Per cent. of liquor in each digestive mixture.	Relative proteolytic action. Sherry.	Beer.
0 per cent.	100.0	100.0
1 "	95.5	101.1
3 "	94.8	98.3

	Sherry.	Beer.
0 per cent.	100.0	100.0
3 "	97.4	100.3
6 "	96.5	98.0

	Whiskey.	Brandy.
0 per cent.	100.0	100.0
1 "	100.3	100.6
3 "	100.0	99.7
6 "	98.4	99.8

Per cent. of liquor in each digestive mixture.	Relative proteolytic action.	
	Brandy.	Sherry.
0 per cent.	100.0	100.0
10 "	97.0	90.8
	Whiskey.	Hochheimer.
0 per cent.	100.0	100.0
10 "	99.1	97.2
	Claret.	Porter.
0 per cent.	100.0	100.0
1 "	100.9	96.2
3 "	96.6	95.0
6 "	98.0	94.4
	Stout.	Ale.
0 per cent.	100.0	100.0
1 "	100.8	98.3
3 "	98.8	97.7
6 "	96.4	95.1
	Bock-beer.	Hochheimer.
0 per cent.	100.0	100.0
1 "	100.5	100.6
3 "	98.4	98.2
6 "	97.9	96.2

Before leaving this phase of our subject it may be wise to emphasize again the exact scope of these experiments. It is to be remembered that the results here recorded are capable merely of throwing light upon the influence of the various alcoholic beverages on the digestive or solvent power of the gastric juice. They are not broadly applicable to a determination of the influence of the liquors in question on gastric digestion, since they afford no light as to the influence of these fluids upon the secretion of gastric juice, or upon the mechanical movements of the stomach, or upon the process of absorption. Hence, if we are to be governed by facts, we are not as yet ready to draw any broad generalizations as to the influence of alcoholic liquors upon gastric digestion. We must at present confine ourselves to the influence of these liquors upon the solvent or digestive action of pepsin-hydrochloric acid or gastric juice, and upon this question the results here recorded speak fully and clearly.

Pancreatic Digestion.

In studying the influence of alcoholic fluids upon pancreatic digestion our experiments have been limited mainly to the proteolytic action, or albumin-digesting power, of the fluid, since this may be considered as the most important digestive function of the secretion. Further, in our experiments with saliva, to be detailed later on, we have acquired all that seems necessary for us to know regarding the influence of alcoholic fluids

upon the starch-digesting power of the amylolytic ferments common to both the saliva and the pancreatic fluid. So far as our knowledge at present extends, there is no difference between the saliva and pancreatic juice in their digestive action on farinaceous foods, so that what is found true with regard to the amylolytic action of the saliva is also applicable to the pancreatic fluid. Hence, in studying pancreatic digestion, our experiments have been limited to the influence of alcoholic fluids upon the tryptic ferment which is so characteristic of this secretion.

The natural secretion from the pancreatic gland has an alkaline reaction, but in the small intestine pancreatic digestion is as liable to be carried on in a neutral reacting fluid as in an alkaline medium, and as our experiments were designed mainly to show the action of the various alcoholic fluids upon the digestive power of the ferment, it seemed best to use a neutral reacting pancreatic juice. The latter was prepared, according to the method originally suggested by Kühne, from dried pancreas which had been previously extracted with alcohol and ether.[1] Forty grams of the prepared pancreas were warmed at 40° C. for twenty-four hours with 500 c.c., 0.1 per cent. salicylic acid, the solution filtered and neutralized with dilute sodium carbonate and then diluted with water to 1000 or 1500 c.c. In order to prevent the possibility of putrefactive changes, crystals of thymol were kept floating on the fluid.

In testing the digestive or proteolytic action of the pancreatic juice under the various conditions set forth, 1 gram of dry, pulverized blood-fibrin was weighed out into a suitable flask, 25 c.c. of water containing sufficient of the alcoholic liquor to give the desired percentage to the whole mixture were then added, followed by 25 c.c. of the neutral pancreatic juice, thus making a total volume of 50 c.c. for each mixture. The mixtures of each series were then placed in the same water-bath at 38°–40° C., where they were kept at the body-temperature for six to seven hours with frequent shaking,[2] the flasks being tightly stoppered. At the end of the given period the undissolved fibrin was filtered off on weighed filter-papers, washed thoroughly with warm water, and then dried at 110° C. until of constant weight. In this manner it was possible to measure very accurately the influence of various forms and quantities of alcoholic liquors upon the pancreatic digestion of proteid foods.

In view of the position which pancreatic digestion occupies in the digestive process, it is readily seen that it is more desirable to ascertain the influence of small quantities of alcoholic liquors than large amounts, since absorption must naturally lead to a decided diminution of alcohol, etc., before these fluids can normally become mixed with the pancreatic

[1] Untersuchungen aus der physiol. Institute d. Universität Heidelberg, Band i, p. 222.

[2] Each mixture contained a trace of thymol and sodium salicylate sufficient to prevent putrefaction.

juice and partially digested food-material in the small intestine. Hence, we have laid more stress, as a rule, upon the influence of small percentages of the various fluids experimented with, and only occasionally have tried the action of large quantities.

Action of Absolute Alcohol (99.5 to 100 Per Cent.).

Experiment 80.

Period of digestion 7 hours.

Absolute alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.[1]	0.5677 gram.	43.3 per cent.	100.0
2 "	0.6102 "	39.0 "	90.0
5 "	0.6574 "	34.3 "	79.2
10 "	0.7394 "	26.1 "	60.2
20 "	0.8446 "	15.6 "	36.0

Experiment 81.

Period of digestion 6 hours.

Absolute alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3467 gram.	65.33 per cent.	100.0
0.25 "	0.3375 "	66.25 "	101.4
0.50 "	0.3563 "	64.37 "	98 5
1.00 "	0.3599 "	64.01 "	97.9
2.00 "	0.3521 "	64.79 "	99.2
3.00 "	0.3780 "	62.20 "	95.2

Experiment 82.

Period of digestion 6 hours.

Absolute alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3058 gram.	69.42 per cent.	100.0
1 "	0 3220 "	67.80 "	97 6
3 "	0.3689 "	63.11 "	90.9
5 "	0.3888 "	61.12 "	88.0
10 "	0.5080 "	49.20 "	70,8
15 "	0.5931 "	40.69 "	58 6
20 "	0.7012 "	29.88 "	43.0

These results with absolute alcohol indicate that the proteolytic ferment of the pancreatic juice is more sensitive to absolute alcohol than the ferment of the gastric juice. Retardation of digestive action is more pronounced even with small amounts of alcohol. Further, as in the case with pepsin, the weaker the digestive powers of the pancreatic juice the greater the retarding action of absolute alcohol. This is clearly

[1] The percentages of fluid added are in every instance given by volume unless otherwise specified.

seen in comparison of Experiments 80 and 82, and is quite in harmony with what is known regarding the general nature of the digestive ferments or enzymes. When the amount of alcohol present in the digesting mixture is less than 1 per cent. the retardation of digestive action is very slight, provided the ferment is fairly vigorous in its action.

Whiskey (with 50 Per Cent. of Alcohol).

Experiment 83.

Period of digestion 8 hours.

Whiskey.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5147 gram.	48.6 per cent.	100.0
1 "	0.5390 "	46.1 "	94.8
3 "	0.5556 "	44.5 "	91.5
5 "	0.5635 "	43.7 "	89.9
10 "	0.5972 "	40.3 "	82.9
Absolute alcohol.			
5 per cent.	0.5621 "	43.8 "	90.1

Experiment 84.

Period of digestion $7\frac{1}{4}$ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3272 gram.	67.3 per cent.	100.0
10 " whiskey	0.4002 "	60.0 "	89.1
10 " " distil.	0.3860 "	61.4 "	91.2
10 " " residue	0.3360 "	66.4 "	98.6
5 " absol. alcohol	0.3858 "	61.5 "	91.3

From these results it is plain that even small amounts of whiskey are detrimental to the digestive action of pancreatic juice on proteid foods. The sensitiveness of the enzyme to this form of alcoholic liquor is quite marked. Further, it is to be noticed that, as with alcohol, the weaker the digestive fluid the stronger is the retarding action of the whiskey. It is also seen that the inhibition produced by a given percentage of whiskey is somewhat greater than that caused by a corresponding percentage of alcohol, thus indicating that there must be some other retarding agent aside from the alcohol present in the whiskey. The general character of this substance is apparent when we compare the action of the distillate and the residue from a given volume of whiskey with that of the whiskey itself.

Thus, the distillate, *i. e.*, the volatile matter of the whiskey, causes less retardation of digestive action than the whiskey itself, although its action is exactly equal to that of a corresponding strength of absolute alcohol. Hence, the difference in action must be attributed to the character of the solid matter present in the liquor, even though the amount present is

small.[1] The experiment, indeed, shows that the residue has a sufficient inhibitory action upon tryptic digestion to account fully for the difference in action between whiskey and a corresponding strength of alcohol. As the whiskey residue is decidedly acid in reaction, and the tryptic ferment is well known to be sensitive to the presence of acids, it is reasonable to assume that it is the presence of the latter which is the cause in part, at least, of the greater inhibitory action of the whiskey over that of corresponding strengths of alcohol.

Influence of So-called Fusel Oils on the Proteolytic Action of Pancreatic Juice.

As already described under the head of gastric digestion, whiskey, brandy, and other distilled liquors of this class are supposedly liable to contamination with so-called fusel oils, of which the higher alcohols are the chief constituents.

We have therefore studied the influence of a number of representative alcohols of this type upon trypsin-proteolysis with a view to ascertaining what effect their possible presence in whiskeys and other like liquors might have upon the rate of pancreatic digestion.[2]

Amyl Alcohol.

Experiment 85.

Period of digestion 6 hours.

Amyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.4090 gram.	59.1 per cent.	100.0
0.05 "	0.4113 "	58.8 "	99.6
0.10 "	0.4117 "	58.8 "	99 5
0.25 "	0.4149 "	58.5 "	99.0
0.50 "	0.4200 "	58.0 "	98.1
1 00 "	0.4740 "	52.6 "	89.0
2.00 "	0.5140 "	48.6 "	82.2

Experiment 86.

Period of digestion 6 hours.

Amyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3107 gram.	68.9 per cent.	100.0
0.05 "	0.3153 "	68.4 "	99.1
0.10 "	0.3442 "	65.5 "	95.1
0.25 "	0.3350 "	66.5 "	96.4
0.50 "	0.3462 "	65.3 "	94.8
1.00 "	0.4027 "	59.7 "	86.6
2.00 "	0.4598 "	54.0 "	78.8

[1] The whiskey contained about 0.3 per cent. of solid matter.

[2] These experiments were carried out in our laboratory by Edward E. Brownell, Ph.B.

Isobutyl Alcohol.

Experiment 87.

Period of digestion 6 hours.

Isobutyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.4185 gram.	58.1 per cent.	100.0
0.05 "	0.4282 "	57.1 "	98.3
0.10 "	0.4305 "	56.9 "	97.9
0.25 "	0.4360 "	56.4 "	97.0
0.50 "	0.4478 "	55.2 "	94.9
1.00 "	0.4491 "	55.0 "	94.7
2.00 "	0.4827 "	47.5 "	81.7

Experiment 88.

Period of digestion 6 hours.

Isobutyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3776 gram.	62.2 per cent.	100.0
0.05 "	0.3796 "	62.0 "	99.7
0.10 "	0.3890 "	61.1 "	98.1
0.25 "	0.3864 "	61.3 "	98.5
0.50 "	0.4116 "	58.8 "	94.5
1.00 "	0.4230 "	57.7 "	92.7
2.00 "	0.4561 "	54.3 "	81.5

Experiment 89.

Period of digestion 6 hours.

Isobutyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2980 gram.	70.2 per cent.	100.0
1 "	0.3334 "	66.6 "	94.9
3 "	0.4052 "	59.4 "	84.7
5 "	0.5431 "	45.6 "	65.0
10 "	0.7333 "	26.6 "	37.9
15 "	0.7743 "	22.5 "	32.1
20 "	0.7813 "	21.8 "	31.1

Propyl Alcohol.

Experiment 90.

Period of digestion 6 hours.

Propyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.4096 gram.	59.0 per cent.	100.0
0.05 "	0.4088 "	59.1 "	100.1
0.10 "	0.4081 "	59.2 "	100.2
0.25 "	0.4100 "	59.0 "	99.9
0.50 "	0.4159 "	58.4 "	98.7
1.00 "	0.4333 "	56.6 "	95.9
2.00 "	0.4336 "	56.6 "	95.9

Experiment 91.

Period of digestion 6 hours.

Propyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3920 gram.	60.8 per cent.	100.0
0.05 "	0.3702 "	62.9 "	103.6
0.10 "	0.3875 "	61.2 "	100.7
0.25 "	0.3946 "	60.5 "	99.5
0.50 "	0.4030 "	59.7 "	98.2
1.00 "	0.4082 "	59.1 "	97.3
2.00 "	0.4210 "	57.9 "	95.2

Experiment 92.

Period of digestion 6 hours.

Propyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3486 gram.	65.1 per cent.	100.0
1 "	0.3420 "	65.8 "	101.0
3 "	0.3900 "	61.0 "	93.6
5 "	0.4456 "	55.4 "	85.1
10 "	0.6032 "	39.6 "	60.9
15 "	0.7850 "	21.5 "	33.0
20 "	0.9255 "	7.4 "	11 4

Methyl Alcohol.

Experiment 93.

Period of digestion 6 hours.

Methyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3850 gram.	61.5 per cent.	100.0
0.25 "	0.3832 "	61.8 "	100.3
0.50 "	0.3931 "	60.7 "	98.7
1.00 "	0.3813 "	61.8 "	100.6
2.00 "	0.3812 "	61.8 "	100.6
3.00 "	0.3862 "	61.3 "	99.7

Experiment 94.

Period of digestion 6 hours.

Methyl alcohol.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3423 gram.	65.7 per cent.	100.0
1 "	0.3702 "	62.9 "	95 7
3 "	0.4143 "	58.5 "	89.2
5 "	0.4237 "	57.6 "	87.7
10 "	0.5253 "	47.4 "	72.3
15 "	0 6195 "	38.0 "	56.3
20 "	0.7170 "	28.3 "	43.0

The following experiment was designed to show the *comparative* action of methyl, ethyl, propyl, and isobutyl alcohols upon trypsin-proteolysis. The period of digestion was six hours at 38–40°.

Experiment 95.

Alcohol added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3117 gram.	68.8 per cent.	100 0
5 " methyl	0.3968 "	60.3 "	87.6
5 " ethyl	0.4081 "	59.2 "	86.0
5 " propyl	0.4620 "	53.8 "	78.1
5 " isobutyl	0.5183 "	48.2 "	70.0
15 " methyl	0.5926 "	40.7 "	59.1
15 " ethyl	0.6213 "	37.8 "	54.9
15 " propyl	0.8155 "	18.4 "	26.7
15 " isobutyl	0.8024 "	19.7 "	28.6

A careful scrutiny of all of the foregoing results obtained with the alcohols liable to be present in so-called fusel oils, shows that their inhibitory action upon trypsin-proteolysis is somewhat greater than that of ordinary ethyl alcohol. When it is considered, however, that they can at the most be present in whiskeys, brandies, and the like only in very small quantities, it is apparent that their retarding action can have little practical influence in modifying ordinary proteolytic action. Physiologically, however, the results obtained in Experiment 95 are extremely interesting, since they tend to show that the retarding action of these alcohols on trypsin-proteolysis increases with the weight of the alcohol. Thus, in digestive mixtures containing 5 per cent. of these alcohols the lowest member of the series, methyl alcohol, has the least inhibitory action, while isobutyl alcohol, the highest alcohol tested, has the greatest retarding effect. If these alcohols were present in any quantity in alcoholic liquors, their retarding action on trypsin-proteolysis would unquestionably be a very important factor; but as there is no evidence that they are ever present in more than traces their action in this direction can have little practical importance.

Brandy (with 48 Per Cent. of Alcohol).

Experiment 96.

Period of digestion $7\frac{5}{12}$ hours.

Brandy.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5531 gram.	44 7 per cent.	100.0
1 "	0.5701 "	43.0 "	96.1
3 "	0 5808 "	42 0 "	93.9
5 "	0.5812 "	41.9 "	93 7
10 "	0.6131 "	38.7 "	86.5
Absolute alcohol.			
5 per cent.	0 6135 "	38.7 "	86.5

Experiment 97.

Period of digestion 8 hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2974 gram.	72.1 per cent.	100.0
10 " brandy	0.3522 "	64.8 "	89.8
10 " " distil.	0.3635 "	63.7 "	88.3
10 " " residue	0.3083 "	69.2 "	95.9
5 " absol. alcohol	0.3475 "	65.3 "	90.5

Here we have much the same results as were obtained with whiskey. Thus, retardation of proteolysis is quite pronounced with 10 per cent. of brandy, but with 1 per cent. it is comparatively slight. Unlike whiskey, however, the action of the brandy is due almost entirely to the alcohol it contains, although the solid matter present in it has some retarding action.

Rum (with 51 Per Cent. of Alcohol).

Experiment 98.

Period of digestion $7\frac{5}{6}$ hours.

Rum.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5611 gram.	43.9 per cent.	100.0
1 "	0.5805 "	42.0 "	95.6
3 "	0.6077 "	39.3 "	89.5
5 "	0.6230 "	37.7 "	85.8
10 "	0.6661 "	33.4 "	76.0
Alsolute alcohol.			
5 per cent.	0.6339 "	36.7 "	83.5

Experiment 99.

Period of digestion 8 hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.2794 gram.	72.1 per cent.	100.0
10 " rum	0.3620 "	63.8 "	88.0
10 " " distillate	0.3562 "	64.4 "	89.3
10 " " residue	0.2974 "	70.3 "	97.5
5 " absol. alcohol	0.3475 "	65.3 "	90.5

With rum, retardation of proteolysis is quite pronounced in the presence of even 5 per cent. of the liquor, although, as in other cases, the exact amount of retardation is dependent largely upon the strength or activity of the pancreatic juice. Further, while the retarding action is

due mainly to the contained alcohol, yet it is evident that the solid matter of the rum has a somewhat deleterious influence, the two factors combining to cause the slow digestive action of mixtures containing 5 and 10 per cent. of rum.

If one should attempt a comparison of the action of these strong alcoholic liquors upon pepsin-proteolysis and trypsin-proteolysis, the conclusion, we think, would be that pepsin-hydrochloric acid is far less sensitive to the action of these alcoholic fluids than trypsin. The latter is far more liable to be retarded in its digestive activity than pepsin by small amounts of these fluids. Further, in trypsin-proteolysis there is not quite so close a relationship between the extent of retardation and the content of alcohol in the fluid under examination. In other words, the tryptic ferment is not only more sensitive to the action of alcohol, but it is likewise more inclined to be affected by the various extractives, especially the acid-reacting bodies, present in these liquors than is the case with pepsin.

Sherry (with 21 Per Cent. of Alcohol and 4.7 Per Cent. of Solid Matter).

Experiment 100.

Period of digestion 8½ hours.

Sherry.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5246 gram.	47.6 per cent.	100.0
1 "	0.5473 "	45.3 "	95.1
3 "	0.5803 "	42.0 "	88.2
5 "	0.6200 "	38.0 "	79.8
10 "	0.7128 "	28.8 "	60.5
Absolute alcohol.			
2 per cent.	0.5776 "	42.3 "	88.8

Experiment 101.

Period of digestion 7¼ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3272 gram.	67.3 per cent.	100.0
10 " sherry	0.4452 "	55.5 "	82.4
10 " " distil.	0.3678 "	63.3 "	94.0
10 " " residue	0.4082 "	59.2 "	87.9
5 " absol. alcohol	0.3858 "	61.5 "	91.3

Claret (with 10 Per Cent. of Alcohol and 3.3 Per Cent. of Solid Matter).

Experiment 102.

Period of digestion 7½ hours.

Claret.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5799 gram.	42.1 per cent.	100.0
1 "	0.5966 "	40.4 "	95.9
3 "	0.6475 "	35.3 "	86.2
5 "	0.6963 "	30.4 "	72.2
10 "	0.8539 "	14.7 "	34.9
Absolute alcohol.			
2 per cent.	0.6020 "	39.8 "	94.5

Experiment 103.

Period of digestion 6 hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3604 gram.	64.0 per cent.	100.0
10 " claret	0.5842 "	41.6 "	65.0
10 " " distil.	0.3963 "	60.4 "	94.3
10 " " residue	0.5403 "	46.0 "	71 8
1 " absol. alcohol	0.3973 "	60.3 "	94.2

Hochheimer (with 11 Per Cent. of Alcohol and 1.8 Per Cent. of Solid Matter).

Experiment 104.

Period of digestion 8½ hours.

Hochheimer.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5325 gram.	46 8 per cent.	100.0
3 "	0.5991 "	40.1 "	85.6
5 "	0.6357 "	36.5 "	77.9
10 "	0.7564 "	24.4 "	52.1
Absolute alcohol.			
1 per cent.	0.5785 "	42 2 "	90.1

Experiment 105.

Period of digestion 6 hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.3604 gram.	64.0 per cent.	100.0
10 " hochheimer	0.5267 "	47.4 "	74.0
10 " " distil.	0.3993 "	60.1 "	93.9
10 " " residue	0.4760 "	52.4 "	81.8
1 " absol. alcohol	0.3973 "	60.3 "	94.2

Comparative Action of Strong Liquors and Wines.

Experiment 106.

Period of digestion 7¼ hours.

Fluid added.	Undigested fibrin.	Proteid digested.	Relative proteolytic action.
0 per cent.	0.5945 gram.	40.6 per cent.	100.0
5 " absol. alcohol	0.6622 "	33.8 "	83.2
10 " whiskey	0.6844 "	31.6 "	77.8
10 " brandy	0.6465 "	35.4 "	87.1[1]
10 " rum	0.6818 "	31.9 "	78.5
10 " sherry	0.7506 "	25.0 "	61.5
10 " hochheimer	0.7850 "	21.5 "	52.9
10 " claret	0.8533 "	14.7 "	36 2

Considering now the import of the results obtained by our study of the action of these wines upon trypsin-proteolysis, it is evident that these fluids have a far greater inhibitory action than the stronger liquors, such as whiskey, brandy, etc. Further, it is plain that the action of any given wine upon the tryptic digestion of proteid foods is quite independent of its content of alcohol. Retardation of digestive action is out of all proportion to the alcohol present in the fluid. Contrast, for example, the action of claret, with the smallest percentage of alcohol, with that of sherry, which contains double the amount of alcohol. Further, between claret and the white wine (hochheimer) there is a wide difference in inhibitory action, although the difference in the content of alcohol amounts to only 1 per cent. The alcohol present in these wines plainly exerts a retarding influence upon proteolysis, as is apparent from the results obtained with the distillates from the respective fluids, and in this connection it is to be noted that the retardation produced by the distillates from both claret and hochheimer is essentially the same, and, moreover, is practically identical with the retardation caused by a corresponding percentage of absolute alcohol.

The greater part of the retardation produced by these wines, however, is clearly connected with the character of the solid matter present in the fluids. Thus, it is to be noted that there is no close relationship, at least, between the amount of solid matter in the wine and its inhibitory action. We therefore sought for some explanation of the above results in the specific character of this solid or non-volatile matter, and our conclusion is that the retardation is due in great part to the amount of acid contained in the respective fluids; a conclusion which will apply not only to the wine-residues, but likewise to the solid matter contained in the stronger alcoholic fluids.

[1] This result is presumably too high, although we know of no cause of error.

The acidity of these fluids was determined by neutralization of a given volume with a standard solution of potassium hydroxide, containing 0.2 per cent. KOH. The relative acidity is indicated by the following figures which show the number of cubic centimetres of the alkali solution required to neutralize 25 c.c. of the respective liquors:

25 c.c.	brandy	required	3 0	c.c.	alkali solution.
25 "	whiskey	"	3.5	"	"
25 "	rum	"	15.0	"	"
25 "	sherry	"	58.5	"	"
25 "	hochheimer	"	80.3	"	"
25 "	claret	"	87.0	"	"

Trypsin, the proteolytic ferment of the pancreatic juice, is well known to be extremely sensitive to the presence of acids, and when this fact is remembered we have, perhaps, in the above data, a full explanation of the marked retardation of trypsin-proteolysis caused by the above acid wines; a retardation far greater than that caused by the alcohol contained in them. Further, the inhibitory action on tryptic digestion produced by the solid matter present in whiskey, brandy, and rum is likewise to be assigned, in part at least, to this same cause. In addition to this possible explanation it must also be remembered that many neutral salts, such as are liable to be present in these liquors, likewise have an inhibitory action on proteolytic enzymes.

(To be continued.)

A CASE OF ACUTE LEAD-ENCEPHALOPATHY WITH INTERESTING OCULAR MANIFESTATIONS.

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L. H., female, a carpet-weaver, aged twenty-two years, was sent to the Episcopal Hospital on January 31, 1894, by Drs. Francis N. Bennett and G. Oram Ring, who had recognized the conditions about to be described, attributing them to intracranial disease.

At the hospital the following history was elicited: The patient's parents were healthy. At the age of ten she had typhoid fever, and since then diphtheria, pleurisy, and malaria. One year ago she was again attacked by malaria, and had not been strong since.

In the early part of August, 1894, she began to have headaches, loss of appetite, vertigo, and dimness of vision. These symptoms increased

gradually in severity, the headaches growing more intense and the difficulty in seeing more pronounced, but not enough to prevent her from continuing at her work in her father's small carpet-factory. Near the end of October she was seized with an illness which her physician said was "grip," and which confined her to bed until a few days before Christmas.

The symptoms of this attack seem to have been an aggravation of her former ones: Constant and intense headaches, failing sight, constipation, and obstinate vomiting, the latter occurring after eating or drinking, but also quite independent of food, and usually without effort.

Shortly before Christmas an amelioration in her condition induced her to get up, but the quick return of the symptoms compelled her to go to bed again. On January 4th a convulsion occurred, evidently, from the description, epileptiform in character. On coming out of this she found herself completely blind, and continued so, with brief intervals of sight, until January 22d, when the blindness became constant.

The convulsions recurred at short intervals, but ceased about the date last mentioned. During most of this time there was more or less delirium, at times violent, and accompanied by hallucinations of sight and hearing.

About January 24th she came under the care of Dr. Bennett, with whom Dr. Ring saw her in consultation. It should be mentioned that menstruation ceased in July and did not return until some time after her entrance into the hospital.

On admission she was extremely anæmic, and there was some fulness under the eyes and œdema above the ankles. The pupils were widely dilated, and she was completely blind. There was intense headache in the occipital region and at the vertex. The tongue was coated, flabby, and covered with a light fur. A blue line was noticed at the margin of the gums, very faint and hardly perceptible over the incisors, but distinct and well defined over the molars. The breath was heavy and fetid. She complained of nausea and obstinate constipation, but there was no colic or abdominal pain of any kind. The muscles were well nourished and their function normal; there was no paralysis or tremor, nor had there been during the whole course of her illness. Neither knee-jerk nor ankle-clonus was present. The temperature was normal.

An examination of the urine revealed no albumin, sugar, or casts. The specific gravity was 1020, the reaction acid. A specimen of the urine was sent to Prof. Marshall, of the University of Pennsylvania, for analysis. A milk-diet, abundance of water, iodide of potassium, gr. x, t. i. d., and a morning-dose of salts was the treatment instituted after the urine had been examined and enough collected for Dr. Marshall's examination.

The following extracts from the hospital-notes (taken by Dr. Charles H. Frazier, resident physician) illustrate the course of the disease after admission:

"*February 7th.* Headache still present, but less intense. Still complains of nausea. Has not vomited since admission, nor have there been convulsions. Is passing about sixty ounces of urine daily, which repeated examinations show to be free from albumin or sugar. Dr. G. Oram Ring, ophthalmologist to the hospital, examined the eyes to-day, and made the following report: 'Light-perception denied. There is paresis of the right external rectus, otherwise the excursion of the eyes

is good. Pupils 6 mm. in diameter, contracting very feebly to oblique illumination (1 mm.). Ophthalmoscope: Right eye, a pronounced neuroretinitis hemorrhagica. The summit of the disk is +7 dioptres, it being swollen four dioptres above the level of the surrounding eye-ground. The veins are greatly distended, and the upper temporal and nasal arteries narrowed. The disk-edges are nowhere seen, and radiating in all directions from what is regarded as the normal border of the nerve are numerous striated hemorrhages, which, in the lower periphery, merge into an extensive hemorrhagic area distinctly suggestive of a magnificent waterfall viewed through a red glass. It is about three times the width of the average disk, and falls in irregular folds, losing itself in the extreme lower periphery. Between the points of a number of the hemorrhages are seen several yellowish-white splotches.

"'Left eye. The swelling of the disk corresponds very closely to that of the right eye, the summit being +7 dioptres. The hemorrhages are more extensive than in O. D., and distinctly surround the disk in an almost solid red area, broken here and there by some yellowish splotches. The appearance noted in the lower periphery of the right eye is not present in this eye.'

"*13th.* It has been ascertained to-day that the patient was treated with iodide of potash and bichloride of mercury for ten days prior to admission. Dr. Ring reports: 'The neuritis is extending far into the periphery, but no hemorrhages except those already noted, which in the right eye are absorbing. The general position of the hemorrhages, as surrounding the disk, is especially to be noted.'

"*22d.* Patient is steadily improving. There is no nausea and scarcely any headache. The appetite is so good that she has been placed upon soft diet. Iodide of potash increased to gr. xx, t. i. d., and salts every other morning.

"*24th.* Attempted to walk about the ward to-day; was very giddy and fainted. Prof. Marshall reported that the urine sent to him contained lead in appreciable amount.

"*26th.* Patient saw near objects for the first time this morning.

"*March 2d.* People passing in front of patient can now be discerned, but their features are indistinguishable. An examination of the urine reveals: albumin, none; specific gravity 1022; reaction acid. From 50 to 60 ounces of urine are voided in the twenty-four hours.

"*19th.* Dr. Ring reports 'hemorrhages in the eye-ground have been completely absorbed. Surface of the disk unduly white.' At his suggestion strychnine, gr. $\frac{1}{48}$, hydrarg. bichloridi, gr. $\frac{1}{48}$, were given thrice daily. Iodide of potassium continued, gr. xxv, t. i. d.

"*24th.* To-day horses and carriages in the street can be seen, and a man can be distinguished from a woman, but only in a bright light.

"Two blood-counts were made by Dr. Joseph McFarland, pathologist to the hospital. The first, shortly after admission, of which the record was lost, revealed about three million of red blood-corpuscles. The second, on March 3d, gave 4,940,000 red corpuscles, with 50 per cent. hæmoglobin.

"She continued to improve during the remainder of her stay in the hospital, and when seen in June Dr. Ring found a further gain in vision: O. D., $\frac{5}{cc}$. O. S. = light-perception. Pupils, 6 mm. Under oblique

illumination the right iris contracts to 4.5 mm. and the left iris to 5 mm. There is no limitation of movement in any direction.

"The eye-grounds are best studied with +3 dioptres. There is distinct atrophy of the disk on each side. In the left eye, in addition to the atrophic nerve, there is an irregular retinal patch marking the position of one of the former hemorrhages, just beyond the temporal border of the nerve."

On September 24th the following note was made: "Vision, O. D., $\frac{20}{LXX}$. O. S., fingers counted at two feet. Nerve vertically ovoid, long.

"The general appearance of the choroid is granular, excepting several minute whitish areas, the remains of former inflammation.

"Is enjoying good health, and is greatly pleased over improvement in vision. Is wearing her correcting-glass +3 spherical. She states that vision in her left eye had never been good, and that earlier in life she had a cast in the eyes, the condition having probably been one of amblyopia ex anopsia."

REMARKS BY DR. MILLER. This case is of interest from many points of view. First, as to the cause. There can be no doubt that the symptoms were due to lead, although when first seen, before the blue line was discovered, the diagnosis lay between intracranial disease (tumor or meningitis) and nephritis. The negative examination of the urine and the history of the case disposed of these affections, while the discovery of the blue line and the presence of lead in the urine were conclusive evidences as to the origin of the girl's illness.

We were for some time at a loss to discover how the poison found entrance into her system. It was at first thought it might have been in some article of diet, having in mind the cases reported some years ago by David D. Stewart,[1] in which teabuns and other cakes were adulterated with lead chromate to give them a yellow tint; but careful inquiry failed to show such a source, the family never eating cakes and making their own bread at home.

Her occupation, that of a carpet-weaver, was next thought of. A visit to her father's factory, a small affair, in which the patient, her father, and one man were employed in weaving cheap ingrain and rag carpets, was at first without results. It was found that for some time before the girl's illness rag-carpets alone were manufactured, and investigation among the dyers of the neighborhood, and particularly at the establishment where the yarns used in the weaving of these carpets had been purchased, showed that aniline colors were exclusively used in dyeing, although prior to ten years ago sugar of lead and lead chromate were extensively employed for this purpose.[2] A second visit was more successful. On this occasion we were told that since June, 1892, window-

[1] Medical News, June 18 and Dec. 21, 1887.

[2] R. C. Smith (Brit Med. Journ., June, 1882, i. 8) reports a number of cases of lead-poisoning in weavers, in the same cotton-mill, from yellow cloth dyed with lead chromate.

shade selvage had been used almost entirely in making rag-carpets. An examination of this material revealed here and there scattered over its surface small particles of dried paint.[1] Throughout the summer and up until the time the patient was disabled by sickness she was engaged in unravelling the selvage and winding it into balls preparatory to weaving. In this process a great deal of dust was given off, which the patient constantly inhaled and perhaps swallowed.

At the factory where the selvage was purchased it was ascertained that ordinary lead-paint was used in coloring the shades. This evidence seemed conclusive, but, to "make assurance double sure," a quantity of the selvage and yarns was sent to Prof. John Marshall for analysis. He replied as follows: "The selvage contains a large quantity of lead. The quantity is large, because a piece about twelve inches long, which I incinerated, furnished the amount of metallic lead which I send you (about one grain), in addition to a quantity which I used in making the wet tests for the metal. The yarns I do not think it necessary to examine."

That form of lead-poisoning in which the action of the metal is limited exclusively to the central nervous system is comparatively rare. Of the immense number of cases, 1390, observed by Tanquerel des Planches,[2] only 72 were of this nature, and of these but 6 occurred without previous signs of lead-disease in other organs.

Those cases in which optic neuritis is a prominent feature are stated by Gowers[3] to take place only in individuals who have been exposed for a long time—often years—to the deleterious influence of the metal. Oliver,[4] however, says that they are apt to be developed, as in the case here reported, in people who have worked but a few weeks or months in a lead-factory, and who, after suffering for a variable time from intense headache and vomiting, suddenly lose sight or become convulsive. In our case pronounced symptoms made their appearance after about two months of exposure. Three months later she was compelled to give up work, and eight weeks after this convulsions, delirium, and absolute blindness occurred. This agrees with Tanquerel's[5] observation, that the greatest number of lead-encephalopathies develop within six months after exposure.

But more interesting than the time in which the poison takes to reveal itself in definite symptoms is the manner in which the symptoms are produced. Many would attribute them to the direct action of lead on the cerebral cells, "that a lead-saturated cell would be incapable of high

[1] This discovery was due to Dr. Charles H. Frazier, the resident physician, who kindly made the second visit.

[2] Tanquerel des Planches: Lead Diseases. English translation, Lowell, 1848.

[3] Medical Ophthalmoscopy, page 233.

[4] T. Oliver, M.A., M.D.: Lead-poisoning. London, 1891.

[5] Loc. cit.

function." Lead has been found in all the organs after death, but particularly in the liver and brain. Blyth[1] found in one case of rapidly fatal lead-poisoning, with pronounced cerebral symptoms, 105.77 mgms. of lead sulphate in the brain, 5.416 mgms. in the kidney, and 24.256 mgms. in 4029 gms. of liver; in another, presenting similar symptoms before death, the brain contained 117.1 mgms., the kidneys 178.9 mgms., and in 299 gms. of liver 24 mgms. of lead sulphate.

Oliver[2] remarks that in not one of his cases did the lead in the brain amount to one grain, which he thinks is a small amount to produce such serious results; but this objection is hardly tenable, since still smaller amounts are found in the kidneys, liver, and other organs; and yet the most pronounced lesions, atrophic and fibroid changes, occur as a direct result of the presence of the metal.

The pathological findings in lead-encephalopathy are variable. In 32 out of 71 autopsies Tanquerel found nothing of note. Von Monkalow[3] discovered a high grade of atrophy, especially marked over the frontal regions, at the vertex, and in the crura cerebri, in a case dying under his observation. Small hemorrhages in parts of the brain, as well as atheromatous conditions of the arteries, have been noted by Seifert,[4] Oeller,[5] and Oppenheim.[6]

Uræmia may doubtless account for some of the cases, particularly the chronic forms with the cirrhotic changes in the kidneys, which the long-continued action of lead is so apt to induce; but many of the cases, generally the more acute varieties, cannot be explained in this way. Albumin is not present in the urine, nor is the specific gravity lowered. In only one of David D. Stewart's patients was there albuminuria, and this was in a woman in the eighth month of pregnancy. The absence of albuminuria, it is true, does not by any means indicate that the kidneys are structurally perfect; but in the majority of instances it does. We may have deficient renal functions brought about by the arterial spasm, which is always more or less present in lead-poisoning. It is to this cause, aided by disturbed hepatic function and consequent deranged metabolism, that Oliver[7] would attribute the majority of the symptoms of saturnine encephalopathy. Elimination is interfered with, and there are retained in the blood animal poisons that act in a deleterious manner upon the brain. Support is added to this view by the recent studies of Hughes and Carter.[8] These investigators have shown that the symptom-complex known as uræmia may occur without any kidney-lesion, and

[1] A. W. Blyth: "Distribution of Lead in Brains of Two Lead-factory Operatives." Journal of Mental Science, London, 1887-8, xxxiii. 483-487.
[2] Loc. cit.
[3] Westphal: "Uber Encephalopathia Saturnina." Archiv für Psychatrie, 1882, xix. p. 620.
[4] Ibid. [5] Ibid. [6] Ibid. [7] Loc. cit.
[8] Hughes and Carter: "A Study of Uræmia." AMERICAN JOURNAL OF THE MEDICAL SCIENCES, Aug. and Sept. 1894.

believe there is a poison occasionally or constantly present in normal blood which is capable not only of inducing uræmia, but also nephritis and fatty degeneration of the retina.

Naunyn[1] adopts practically the same theory, suggesting that lead does not act as a direct poison, but indirectly, giving rise to the presence of a poison in the blood, by the abnormal nutrition of the whole system which it causes.

It is evident no one theory will explain all the phenomena of lead-encephalopathy, and we are forced to conclude that the action of the poison is a variable one. There can be little doubt, however, that the metal acts primarily on the nervous system, while, for the patient whose case is here recorded, we are inclined to accept the explanation of Oliver that the symptoms were due to the presence of a poison, whose elimination was prevented by the operation of lead on the hepatic, venous, and arterial systems.

Remarks by Dr. Ring. From the view-point of the ophthalmologist, the symptoms above noted claim attention by reason of their comparative rarity, and because they sustain the claim of T. Oliver and others that in a few well-established instances a true plumbic neuroretinitis exists, quite independent of the intraocular changes that are clearly secondary to well-known kidney-lesions.

The urine was absolutely free from albumin and casts during the entire period of her illness.

The various ocular manifestations of lead-poisoning have been recently reviewed by Dr. Casey Wood,[2] of Chicago, and by Dr. G. E. de Schweinitz,[3] of Philadelphia. A few of the positive ocular changes were recognized in the pre-ophthalmoscopic era, but it has been especially since the marvellous discovery of Helmholtz that ophthalmic literature has been enriched by many authentic publications. Very few, however, have presented the symptoms noted in the case here published.

The frequency of ocular disease in lead-poisoning may be concluded from the statement of Stood, that optic-nerve changes are present in fifty per cent. of the cases. In sixty-four cases analyzed by de Schweinitz to determine this point, optic neuritis was present in thirteen, neuroretinitis in four, optic atrophy in seventeen; so that the percentage given in the statement of Stood is not too high.

The frequent coexistence of kidney- and brain-lesions makes it exceedingly difficult at times to determine whether the intraocular changes are the direct resultant of the presence of lead, or whether they are secondary to chronic Bright's disease, or specific intracranial disease. The remark of Gowers is pertinent that "the possibility of a renal neuritis

[1] J. C. Wilson: "Chronic Lead-poisoning." Am. System of Medicine, vol. v. p. 689.
[2] "Toxic Amblyopiæ." Annals of Ophthalmology and Otology, July, 1894.
[3] Alvarenga Prize Essay: "Toxic Amblyopiæ." College of Physicians, Phila., 1894.

must be borne in mind;" and, again, "an intracranial syphilitic growth may coexist with lead-poisoning and give rise to ocular symptoms;"[1] and as the ordinary treatment of lead-poisoning may remove the specific lesion, the error in attributing the condition to the wrong cause is one of comparative ease.

The divisions of the ocular manifestations of lead-poisoning may be said to be:

1. Transient amblyopia without definite ophthalmoscopic changes; the diminution of vision usually being bilateral or more marked upon one side, regarded by Thomas Oliver[2] as due to the anæsthetic effect of lead upon the retina and optic nerve, and by Gowers as due to the effect of lead upon the visual centres. Such attacks may occur frequently and be followed by atrophy.

If the amblyopia is incomplete, it is usually attended with concentric limitation of the field of vision and by loss of color-sense.

2. Retrobulbar neuritis, or an interstitial neuritis in that portion of the trunk of the optic nerve which lies within the optic canal, and limited to the papillomacular bundle as in cases by Uthoff, De Wecker, and Masselon (quoted by Wood), combined in some instances with a slight congestion of the nerve-head and retina, but in which a well-marked central scotoma was present; the continued poisoning by lead usually causing a change from a relative to an absolute scotoma. Annular scotomata are noted by Landolt, and occasional green vision by Gowers.

3. Optic neuritis or neuroretinitis, which, according to Oliver,[3] is of two kinds—one, the acute, in which the borders of the disk are swollen, ill-defined, and irregular; the disk itself hyperæmic and mottled or generally reddened; the vessels obscured or narrowed, and having delicate white lines running along their borders; the veins distended; striated hemorrhages found at the borders of the disk or in the retina; the condition being frequently followed by partial or complete restoration of sight.

The second form is usually found in the older cases in which albuminuria is present with a more or less typical picture of retinitis albuminurica, swollen disks, with extensive patches of exudate around the vessels.

I have found no reference in the recent reviews to two cases occurring in the practice of Dr. William F. Norris,[4] in which he notes marked choking of the disks with severe cerebral symptoms. One recovered and one died. Albumin was not present in either. Both resulted from the use of white lead as a cosmetic. Gowers[5] figures a case in which neuro-

[1] Gowers: Diseases of the Nervous System.
[2] Thomas Oliver: Lead-poisoning. [3] Ibid.
[4] "Medical Ophthalmoscopy." American System of Medicine, vol. iv.
[5] Gowers: Medical Ophthalmoscopy.

retinitis was pronounced, with striated hemorrhages at the border of the disk.

The assignment of a definite cause for the optic neuritis is exceedingly difficult, owing to the variety of conditions obtaining at one and the same time. T. Oliver[1] suggests that it may be due to a descending neuritis or a distention of the nerve-sheath. Leber and Deutschmann,[2] that it may be caused by irritating particles carried by means of subarachnoid fluid from the brain-cavity to the vaginal sheaths surrounding the nerve. Jeaffreson[3] does not regard the neuritis as in any way especially related to lead. The mechanical action of the lead in inducing rapid effusion into the ventricles and subarachnoid spaces, he thinks, may distend the nerves' sheaths.

Menstrual disorders, especially amenorrhœa, he regards as a strong predisposing cause of the neuritis.

4. Optic-nerve atrophy consecutive to a papillitis, or chronic from its inception, and independent of any previous inflammation of the disk. In this latter condition, according to Casey Wood, there exists a slight congestion of the disk, accompanied by very little swelling; the disk eventually becoming dirty gray in tint, with white lines running along the narrowed vessels.

5. Retinitis unaccompanied by any gross changes in the nerve, but manifesting itself by changes in the bloodvessel-walls and surrounding tissues (vasculitis and perivasculitis[4]), at times associated with the intra-ocular lesions of kidney-disease.

6. Paralysis of external ocular muscles. One of Landesberg's[5] cases had a bilateral paralysis of the external rectus, another of all branches of the oculomotor, and Von Schrader's[6] had bilateral abducens paralysis, associated with neuroretinitis.

[1] Gulstonian Lectures, "Lead-poisoning," Thomas Oliver, 1891.
[2] Ibid.
[3] Clinical Lecture, "Optic Neuritis." Lancet, May 3, 1890.
[4] De Schweinitz: Toxic Amblyopiæ.
[5] Quoted by Casey Wood.
[6] Ibid.

REVIEWS.

CUTANEOUS MEDICINE: A SYSTEMATIC TREATISE ON THE DISEASES OF THE SKIN. By LOUIS A. DUHRING, M.D., Professor of Diseases of the Skin in the University of Pennsylvania. Author of *A Practical Treatise on Diseases of the Skin and Atlas of Skin Diseases.* Part I. Anatomy, Physiology, Symptomatology, Etiology, Pathology, Diagnosis, Treatment, and Prognosis. 1895.

IT is not too much to say that this work promises to be the most thorough and exhaustive treatise on the subject of diseases of the skin which has ever appeared. This first part, embracing 221 pages, covering only the introductory subjects, exhibits an amount of research, an accuracy of information, and a clearness of presentation which are remarkable and which show the immense strides which this branch of medicine has taken during the past twenty-five years.

The sections on Anatomy and Physiology of the Skin cover 70 pages, and are by far the fullest presentation of the subject with which we are acquainted, including the researches of dozens of observers, with very many plates exhibiting the histological appearances, taken from a large number of works, some of them very recent.

The section on General Etiology is very intelligent and shows broad observation and a full appreciation of the general relations of diseases of the skin to systemic and other disorders. The author states emphatically that "in many instances it will be found that manifestations on the skin are but indexes or direct symptoms of disorder in other parts of the system." The subjects of diathesis, temperament, predisposition, and idiosyncrasy are discussed in a strong manner, while the relations of many skin-diseases to kidney-derangement, gout, and rheumatism, as also to the respiratory, sexual, and nervous systems, are given full consideration. The subjects of food, dentition, vaccination, etc., are also given due attention. It is gratifying in these days when local etiology and treatment are so strongly emphasized by many to find a broader view of dermatological relations so strongly presented.

External causes are also fully considered in this and the section on General Pathology, but with the remark, "Many of them are to be viewed as exciting causes, giving rise to disorder only under peculiar conditions, or in those cases where there exists a predisposition to the disease manifesting itself."

The section on General Diagnosis, though brief, is excellent, due attention being given to a consideration of the patient in regard to the state of physical health, the performance of functions, etc.

The section on General Treatment, covering over 50 pages, contains an excellent summary of the present state of dermal therapeutics, including both the older measures and those of most recent date. While local

remedies occupy the larger space, constitutional and general treatment are well considered and their necessity strongly emphasized.

The work has been styled "Cutaneous Medicine," a new title in this line of work, and from the preface, and what may be learned from this first portion, we believe that it will do much to elevate this branch of medical study and practice.

The success which has attended the three editions of the author's former *Treatise on Diseases of the Skin* will, no doubt, cause this complete and exhaustive work to be in much demand. From what we know of the author's former writings it will be a practical, safe, and valuable work for every practitioner of medicine.

While the whole is written in a very clear and readable manner, there are indications here and there of a tendency to foreign idioms in the inversion of sentences, etc.; the absence of an index renders the part less convenient for ready reference, but this will undoubtedly be fully supplied when the work is complete. L. D. B.

TEXT-BOOK OF OPERATIVE SURGERY. By THEODORE KOCHER, Professor of Surgery and Director of the Surgical Clinic in the University of Berne. Translated with the special authority of the author from the second revised and enlarged German edition, by HAROLD J. STILES, M.B., F.R.C.S. Edin., Senior Demonstrator of Surgery and formerly Demonstrator of Anatomy in the University of Edinburgh, and Assistant Surgeon, Royal Edinburgh Hospital for Sick Children. With one hundred and eighty-five illustrations. London: Adam and Charles Black, 1895.

THIS is an English edition of Professor Kocher's well-known work on *Operative Surgery*. There is no attempt on the part of the author to make it a systematic treatise; it deals with such measures as are personally familiar to him, and the value of the book depends upon the personal elements in which it abounds. It is the actual operative creed of a well-known and experienced operator, therefore is a description of certain measures which he has found successful and commends. The work is essentially German, credit, as a rule, being only given to Continental operators, 90 per cent. of those quoted being German, while English and American names are conspicuous by their absence.

Part I. consists of a short introduction, chapters on anæsthesia and wound-treatment. Under this head preference is given to corrosive sublimate, rather than to carbolic acid, for the sterilization of the hands and cutaneous surfaces. Instruments are prepared by steaming and boiling. Iodoform is considered to hold no place in the aseptic treatment of wounds, but is regarded as the most active drug in combating suppuration just begun or already far advanced. The author's ideas of skin-incisions are somewhat at variance with those held by the majority of surgeons in this country, since he considers that they should always be governed by the natural lines of cleavage of the skin, as pointed out by Langer, rather than by the situation of cutaneous nerves or the advantage offered with regard to drainage or cosmic effect. Perfect drainage is strongly advocated by means of glass tubes, the latter to be inserted

through a special opening in the skin, rather than through the angle in the wound.

It will be noticed that in the descriptions of many special operations, as the transverse incision for suprapubic cystotomy, and a similar transverse incision in the neck for the removal of goitres, he contends that the scar which follows is less disfiguring by following the natural folds or cleavage of the skin; also that the parts in the operation are more accessible through this incision; but when large tumors are to be dealt with, a vertical incision can also be made. The author's enormous experience in this operation, however, must command our attention and respect. The method pursued in cerebral localization seems unnecessarily complicated, requiring a special instrument devised for the purpose. In abdominal operations, as gastrostomy, Albert's or Frank's method is preferred, which establishes at one operation a valve-like opening into the stomach, thus preventing escape of its contents. The Czerny-Lembert method is advocated for enterotomy, and special stress is laid upon the accurate introduction of the sutures. No mention is made of assistance to be derived from the use of buttons, plates, or rings, so extensively employed here. Lumbar colotomy is omitted, and the iliac operation is described. In paracentesis abdominis the point of puncture, as advised, is midway between the umbilicus and the middle of Poupart's ligament. In the operation for the removal of the vermiform appendix the incision is such that more muscular fibres are sacrificed than when the semilunar line is followed; the appendix is severed with the actual cautery. No mention whatever is made of McBurney's gridiron operation.

The chapter on excisions and resections is clear and most satisfactory; exception to the excision of one-half of the pelvis might however be made by conservative surgeons, although it is stated that the operation has been performed by the author with very satisfactory functional results. The patient, in whom the head of the femur was at the same time excised, can walk without a stick, although distinctly lame.

In performing nephrectomy upon the loin, it is advised that the incision be extended a little further than is usually done, in order that the peritoneum may be opened and the hand inserted to explore the other kidney. A somewhat scanty description is given of the various operations for the relief of trigeminal neuralgia, most of them dealing with the peripheral branches. No mention whatever is made of the intracranial operation for attacking the ganglion. We regret that there has been no attempt to deal with any of the plastic operations. The chapter on amputations is the least satisfactory in the book.

Enough has been said to illustrate some of the principal features of the book, and we can confidently recommend it as full of instruction. It will be appreciated more thoroughly by the operating-surgeon than by the student or young practitioner. The latter may feel that he has not sufficient guidance in the most practical and useful operations, many of those described being seldom employed except on the cadaver. The translation has been excellently accomplished by Mr. Stiles. The illustrations are admirable, and the text all that can be desired. Unfortunately, the index is omitted. R. H. H.

KLINISCHE VORLESUNGEN UBER SYPHILIS. VON DURING. Hamburg und Leipzig: Leopold Voss, 1895.
CLINICAL LECTURES ON SYPHILIS. By DURING.

STIMULATED, no doubt, by the brilliant example of the younger French syphilographers the author has published an admirable volume, based upon the clinical study of syphilis. This work does not in any way pretend to be a text-book, but rather embodies the practical views of a keen observer and one who has had wide experience. The first chapter deals with the history of the disease, its distribution, and its severe manifestations when attacking people previously not infected. The character of the contagion-periods, the primary lesion and general intoxication, and parasyphilitic lesions are briefly considered. The chapter ends with a very strong argument as to the analogy of syphilis with other infectious diseases and an anatomical study of the primary lesion.

The question of immunity is considered in the second chapter, the statement being made that the acquired immunity is developed almost immediately after infection.

A consideration of the essential difference between chancroid and syphilis, to which the third chapter is devoted, would seem superfluous at the present time.

In common with most authors Von During holds that acquired syphilis is impossible without the primary lesion. The history of many minutely observed cases should certainly relegate this question to that class which is, at least, open to discussion. The complications of the primary lesion are classified into the headings phimosis, gangrene, and hemorrhage; these are scarcely sufficiently comprehensive. The blood-changes of the secondary period are carefully described. The sections dealing with the skin-eruptions of the disease correspond to those found in the ordinary text-book. Differential diagnosis between syphilitic leg-ulcers and those depending upon varicose veins is founded upon the points already well known, the author holding that a proper determination is usually easy, an opinion with which many experienced surgeons will not agree. A chapter is devoted to bone-syphilis, with a few paragraphs upon affections of the tendons, bursæ, and ligaments. Affections of the circulatory system are very briefly considered. In discussing syphilis of the heart the author justly states that there are no sharp diagnostic symptoms, but that whenever a person with previous syphilis shows the signs of heart-disease an active antisyphilitic course of treatment should be instituted. He does not mention that sudden death is a very frequent termination of these cases. The fibroid induration of the cavernous bodies he classes as specific, although Mauriac has clearly shown that this affection is non-specific in origin.

Syphilis of the nervous system is very briefly considered, yet this chapter will be found unusually complete and accurate. In the section on treatment it is taught that excision of the chancre is useless. The author's therapy represents an intelligent study of all the recognized methods of administering mercury and iodide of potassium. The treatment should be begun only under exceptional circumstances before the appearance of secondaries. This statement is finding fewer followers each year.

The work can be warmly commended as an excellent clinical summary of the knowledge of syphilis as it has been developed by most recent research. Less voluminous than Mauriac's scholarly volumes, more clearly formulated than Finger's book, it should be serviceable both to the specialist and general practitioner.

E. M.

AN AMERICAN TEXT-BOOK OF OBSTETRICS FOR PRACTITIONERS AND STUDENTS. By JAMES C. CAMERON, M.D., EDWARD P. DAVIS, M.D., ROBERT L. DICKINSON, M.D., CHARLES WARRINGTON EARLE, M.D., JAMES H. ETHERIDGE, M.D., HENRY J. GARRIGUES, M.D., BARTON COOKE HIRST, M.D., CHARLES JEWETT, M.D., HOWARD A. KELLY, M.D., RICHARD C. NORRIS, M.D., CHAUNCEY D. PALMER, M.D., THEOPHILUS PARVIN, M.D., GEORGE A. PIERSOL, M.D., EDWARD REYNOLDS, M.D., HENRY SCHWARZ, M.D., RICHARD C. NORRIS, M.D., Editor; ROBERT L. DICKINSON, M.D., Art Editor. With nearly 900 colored and half-tone illustrations. 8vo., pp. 1000. Philadelphia: W. B. Saunders, 1895.

A *Text-book of Obstetrics* by sixteen different authors has reached us, and we believe the nature of the work demands more than a passing notice. Practitioners and students of medicine possess one or more text-books of obstetrics written by single authors, and many of us several books by the same authors many times revised; but we believe a text-book by more than one individual has not heretofore appeared, at least during the last decade. The demand for a work which should not only embody the teachings of several prominent American obstetricians, thus reflecting all recent progress made in the theory and practice of obstetrics, but should also be a standard teaching-work for students and a guide for practitioners, has called for the present book. The sixteen different authors selected will be at once recognized by all as well-known and experienced teachers of obstetrics in several of the leading medical schools and hospitals of America.

A welcome and necessary feature of the present *Text-book*, not, we are sorry to say, always found in composite publications, is the readily recognizable correlation of the subject-matter, so that although various authors are assigned special themes for discussion, still an attempt, and a generally successful one at that, has been made to preserve throughout the text a logical sequence.

Still another satisfactory feature is that the table of contents indicates the authorship of each section.

Nearly nine hundred colored and half-tone illustrations are to be found in the work, and we cannot pass to a consideration of the text without a word in regard to the accuracy as well as artistic beauty of these illustrations. A little study of the illustrations reveals the fact that most of them are systematically drawn to a scale, uniformity generally being preserved—usually one-third or one-sixth life-size. This will become evident to any reader who, for instance, will take the trouble to compare the conjugatæ veræ of several sagittal sections in the work. The same holds good for the figures. We can only regret that the principle was

not carried further, and, in addition to the full labelling which we find made directly upon the drawings, the scale of reduction from life-size was not also added. Each borrowed engraving has been properly credited, and all have been redrawn, excepting those reproduced from the well-known copper-plates of Hunter and Smellie. We recognize some friends in cuts which come from France through the work of Farabeuf and Varnier, relating to diagnosis and mechanism; from Germany, through Braun, Schroeder, Waldeyer, and Zweifel, regarding accuracy in topographical anatomy; and from Scotland, through the atlases of Hart, Barbour, and Webster, concerning the structure of the pelvic floor. Such a reillustration of an entire department of medicine could only have been rendered possible by an unprecedented liberality on the part of the publisher, and he, together with the art editor, has left nothing undone that could add in the least to the artistic beauty above referred to.

The work comprises some one thousand pages, divided in six sections as follows: I. The Generative Organs, including their Anatomy and Physiology; II. Pregnancy, including its Physiology, Diagnosis, Hygiene, Management, and Pathology; III. Labor, with its Physiology, Conduct, Mechanism, and Dystocia; IV. Puerperium, together with its Physiology, Diagnosis, Management, and Pathology; V. Newborn Infant, its Physiology and Pathology; VI. Obstetric Surgery, with the subheadings of Instrumental Operations, Manual Operations, and Cœliotomy for Sepsis in the Childbearing Period.

In Section I., the Generative Organs, we first find the anatomy of the bony pelvis taken up, and, with the aid of the multitude of clear and attractive illustrations, described in a most comprehensive manner. We note that a careful exposition is given us of the pelvic articulations, particularly of that at the pubis, and we naturally look for a more comprehensive description of the position of the pelvis in the skeleton, as effected by the changes in the posture of the body, in view of the claims made in the last two years regarding the effect of increased pelvic inclination upon the conjugata vera. We find no reference to Walcher's position at this point, although it is sufficiently described under version on pages 960 and 961. The pelvic floor, its muscles, fascia, vessels, and construction is well cared for, due importance being given, as should be the case in a work upon obstetrics, to the levator ani muscle. The anatomy of the female generative organs, comprising thirty-three pages, five of which are given to the mammary glands, is concise and written in a style for a work destined to be used as a text-book.

Three pages only are assigned to the physiology of these organs, namely, to ovulation and menstruation, and we believe, in view of the abbreviated nature of this section, that Marshall's conclusions, that "the decidua of a particular menstrual period is related, not to the ovum discharged at that period, but to the ovum discharged at the preceding period," is given undue prominence, and is, in fact, not altogether "fully warranted by the more exact data furnished by careful observation."

Eighty-six pages are assigned to the physiology of pregnancy, sixty-two of which are taken up with the development of the embryo and the fœtus. Embryology and the formation and relations of the various membranes, embryonic and fœtal structures, are fully illustrated by reproductions of sections and by diagrammatic figures. We would have wished that more space were given to the formation and anatomical structure of the various deciduæ, and that the relation of the *constructive*

stage (Marshall) of menstruation and the formation of the vera were more forcibly brought out here instead of under the section on Menstruation. A few lines on page 86 dispose of the deciduæ.

Among the Changes in the Maternal Organism Induced by Pregnancy due prominence is given to Webster's recent work in frozen sections. We are glad to notice that when the writer comes to take up the changes produced in the urine by a physiological pregnancy, two pages are given at this point to the albuminuria of pregnancy which is not followed by other symptoms of toxæmia. "If the presence of albumin is but slight, it may be physiological, or, if pathological, no noticeable symptoms may be observed; but if it is considerable and persistent, and if it occurs early in pregnancy, the prognosis is grave. . . . From a clinical standpoint it is ordinarily presumed that when there is albuminuria there is also uræmia to a corresponding degree . . . but certainly these two functional disorders do not hold the same proportion or relation. There may be much albuminuria and but little uræmia, and *vice versa*. It is the degree of the latter disorder that forebodes evil."

We believe the above, in view of modern investigation into the toxæmia of pregnancy, to be sound and safe teaching, and the concluding sentence of this section, where, in order to eliminate from the blood the poisonous material of urea and its products, we are directed first "to act as potently as we can" upon the "compensatory organs of the kidneys," namely, the bowels and the skin, and afterward turn our attention to the control of other symptoms, to be equally reliable teaching for the student or practitioner.

We find under Accidents and Surgical Operations during Pregnancy much evidence drawn from cases and the recent literature of the subject to prove that major operations are generally well borne by the pregnant woman; on the other hand, we are reminded that minor surgical procedures of an irritant character are sometimes, if not often, attended by disastrous results. Thus the case observed by Fancon in the clinic at Strasburg is cited where a neglected sprain demanded cauterization of the ankle-joint. Abortion resulted, followed by septicæmia, necessitating amputation.

Fourteen pages are given to the subject of Abortion, of which but a single page is assigned to its pathology. The use of the tampon is advised in inevitable abortion to control hemorrhage before the fourth month; after that time it is considered dangerous, on account of concealed hemorrhage, and rupturing of the membranes is to be preferred, and that failing, the emptying of the uterus as quickly as possible. In incomplete abortion, in mild cases, in the absence of sepsis, a conservative treatment is allowed, namely, the use of ergot, vaginal douches, and the tampon. In the presence of much pain, hemorrhage, or suspicion of sepsis, complete emptying of the uterus by digital curettage is given the preference to instrumental.

The subject of Extrauterine Pregnancy is clearly and concisely presented, especially the directions regarding the operative treatment. The electrical treatment has, the writer tells us, "deservedly fallen into disrepute," and the injection of fluids into the sac for the purpose of killing the fœtus "is only mentioned to be condemned." The preparations and details for operation before rupture of the sac, at the time of rupture, after rupture, and after calcification, mummification, or suppuration of the fœtus, are set forth in detail, and will prove, we feel sure, a valu-

able portion of the work, and one often to be referred to for aid in these emergencies.

The Conduct of Normal Labor, including antisepsis, practical and working rules for disinfecting in both hospital and private practice, the obstetric examination, including internal and external pelvimetry, the arrangement of the lying-in room in private practice, anæsthesia, the repair of lacerations, is all that can be desired as regards the text, and is in addition fully and beautifully illustrated, with few exceptions, by means of half-tone reproductions of photographs or drawings taken at the bedside. We know of no description of this important subject in any language that can equal the present one for clearness of diction and illustration. The Mechanism of Labor in the following hundred pages is scientifically and clearly set forth.

In the next one hundred and fifty pages the subject of Dystocia is ably discussed. Pelvimetry is here again gone into and illustrated, and the pathological museums of Philadelphia, Washington, and New York have been ransacked for instances of pelvic deformity, which are here reproduced, many of them with their measurements added, which latter renders the illustrations doubly valuable.

Another one hundred and fifty pages are assigned to the Puerperium, which is divided into four sections, as above stated. Under the physiology of the condition due stress is laid upon the fact of the lying-in woman being "eminently predisposed to disease." Webster's recent work in frozen sections of the puerperal woman is given due prominence. We are pleased to note that the diagnosis of the puerperal state, usually omitted in text-books, or only given a few lines, is here given the place it deserves.

The section upon Puerperal Infection is an exhaustive and scientific exposition of the subject. The terms "puerperal fever" and "puerperal septicæmia" are rejected as "both too wide and too narrow for our purposes," and preference is given to that of "puerperal infection," because that term designates pathological conditions occurring during pregnancy, labor, and the puerperium which are both mild and severe, as well as local and general. The text clearly indicates the belief of the writer in the possibility of the transmission of the infecting agent in puerperal infection through the air to a limited extent, and the history of the so-called "epidemic" of puerperal fever at the New York Maternity Hospital following the application of guano to an adjacent garden is quoted in proof of this belief. Statistical tables we find here showing in an interesting and concise manner the revolution in mortality of childbirth that the antiseptic treatment of the condition has wrought. Most explicit directions as regards the preventive treatment are given, and even in this day of antiseptic surgery are well worth a careful perusal. Speaking of apparently normal labor, we find the statement: "No one can foresee—the average general practitioner least of all—what complications may arise during labor. Where an easy delivery has been promised the healthy primipara, it may become necessary to perform version, etc., and . . . the result . . . depends almost entirely on the aseptic or the septic condition of the patient at the time of its performance, taking for granted that the operator uses all antiseptic precautions." Following in italics we find this sentence: "*The doctor and the nurse should know that they jeopardize their patient's life by introducing into her vagina a finger that is not disinfected.*" The curative treatment is

admitted to be much less effective than the preventive, and the various procedures to be carried out after infection has occurred are carefully stated.

The concluding section of the work is that upon Obstetric Surgery, which includes a timely and interesting discussion of the subject of Cœliotomy for Sepsis in the Childbearing Period. We regret that in a work of the present character that no mention is made, if only to condemn it, of manual dilatation of the os as an obstetric surgical procedure; only once (page 596, under Placenta Prævia) do we find accouchement forcé mentioned. Instrumental dilatation of the uterus by means of Hegar's, Tarnier's, Barnes's, and Champetier de Ribes's dilators is fully described and illustrated. Incision of the parturient cervix, multiple or deep, we fail to find reference to, and perhaps it is properly omitted, in view of the fact that our data are not yet sufficient to warrant positive conclusions.

The obstetrician and the general practitioner will find this book not only a pleasant and interesting volume, but the most valuable of its kind, both on account of the wide experience of the several authors and because of the attractiveness and accuracy of its illustrations. Its value to the student is enhanced, in addition to the above, because of the systematic avoidance of conflicting statements and the fulness and clearness with which directions for treatment are stated. As an authority, as a book of reference, as a "working-book" for the student or practitioner, we commend it because we believe there is no better. J. C. E.

A Text-book of Practical Medicine, designed for the Use of Students and Practitioners of Medicine. By Alfred L. Loomis, M.D., LL.D. Eleventh edition. New York: William Wood & Co., 1895.

A text-book that has gone through ten editions in as many years is a rare thing in these days, when competitors issue from the press at the rate of about one a month. When the first edition of the work before us appeared the field was not so full, yet it kept its place, and the appearance of this eleventh edition shows a determination to maintain its position. At least we assume that this is the reason for its appearance, and that it is not issued as a memorial to its author.

It might seem that criticism of such a work would be superfluous, but the critic has semi-historical duties to perform. He knows that text-books on the practice of medicine have their fates, like others, and so furnish striking but melancholy evidences of the progress of our art.

The plan of Dr. Loomis's book will rarely be followed in future works on practice. The introductory chapters on General Pathology and Bacteriology may have been necessary in former days, but do not now serve any useful purpose.

In reading the subsequent chapters it is easy to find the reason for the popularity of this work. That is due, we think, to the air of candor and sincerity pervading all its pages. Encyclopædic knowledge is not set forth, but in almost every chapter it is made clear that the author had observed carefully, had thought earnestly for himself, and so had arrived at convictions of original and real value. All this is set forth in a plain and simple way, so that the student sees clear pictures of disease to store

in his memory, and the physician finds in positive terms what he formerly but dimly grasped. Such books are read by students of medical literature long after the mere compilations are forgotten. The descriptions of signs and symptoms are painstaking and on the whole accurate; the directions for treatment minute and careful, revealing the skilled practical therapeutist. Remedies are recommended confidently, at times freely, but never without a conviction as to their value. On the other hand, drugs found useless by the author are so described. The style is usually clear and plain. At times a semi-didactic manner is adopted, and repetition, so useful in oral instruction, is sometimes used with good effect, as in the chapter on Pneumonia, in which the panting respiration is mentioned several times. Occasionally the statements are unintelligible, as when the author tells us (p. 265) that "most patients do best on a diet free from hydrocarbons," or that for patients with gastric ulcer rest in bed for three months is necessary. "Spiliform" bacilli (p. 29) are new to us; the statement (p. 332) "Iceland is the only country in which the hæmatoids are not found" does not convey any information; nor can we imagine what is meant by the following (p. 818): "An organized ferment, *bacterium* or *tarnea* (which develops to a certain point in a proper medium and then suddenly ceases its career), has been found in blood and breath and in glycerin on which children with measles have breathed."

The classification is in some respects peculiar. Basedow's disease is placed among diseases of the heart; dengue is considered between the sections on Acute and Chronic Malaria; there is a chapter on "Gastric Dyspepsia," in which no good reasons are given for the use of such a term. The work shows strange survivals in the sections on Pathology. It is said (p. 265) that "the varieties of cancer of the stomach are scirrhus, medullary, and epithelial. Any one may undergo colloid degeneration and thus appear as either villous or melanotic cancer." The introduction to the section on malaria shows the influence of modern investigations. The statement, however, that "forms of malarial parasites ripe for segmentation are not often seen in the blood from the finger, except in malignant cases," is not correct. The pathology of malarial pigmentation as here given is purely fanciful, and all through the discussion of malarial disease ancient and long-abandoned views are advanced, to the exclusion of modern and exact knowledge now so accessible.

In the sections on Diagnosis newer methods are rarely mentioned. The stomach-pump[!] is recommended several times, but the systematic use of the stomach-tube in diagnosis and the chemical and other examinations of the stomach-contents are not referred to. The modern methods of examining the blood are not alluded to.

The remarks on treatment are for the most part commendable. The indications for and method of cold bathing in typhoid fever are not such as should be followed. The section on Diphtheria, which is said to have been revised by a specialist, has a non-committal note on the serum-treatment which is not only antiquated, but all the more aggravating because of the evident room for an adequate statement The assertion that "Loreta's operation of digital divulsion" of the pylorus "has been followed by quite invariably favorable results" (p. 283) is very remarkable, the result in a large percentage of cases being death, and in many others failure.

The section on Nervous Diseases, also revised by a specialist, makes no mention of the neuron doctrine, while the description of "system-diseases" is said to be recent.

The work is evidently no longer useful as a text-book. It is to be read rather for what it was than what it is; as a picture of the practice of the past rather than a guide to the present. Some of the chapters, as those on Smallpox, Typhus Fever, and Relapsing Fever, can long be referred to by reason of the fidelity of their descriptions of disease.

It is to be regretted that the mechanical execution of the work is not more adapted to honor the author whose loss the profession as a whole, as well as the numerous readers of former editions, will long deplore. The plates are badly battered, the cuts worn, and the proof-reading wretched. An enumeration of the inexcusable typographical errors would far exceed the limits of an ordinary review. G. D.

A Manual of the Modern Theory and Technique of Surgical Asepsis. By Carl Beck, M.D. Philadelphia: W. B. Saunders, 1895.

This little volume is unlike anything hitherto published in that it combines the practical and the theoretical in the treatment of wounds. There are chapters on the Influence of Microbes, the Importance of Asepsis, Means of Disinfection, Prophylactic Disinfection, Disinfection of Instruments and Dressings, Aseptic Open-wound Treatment, Renewal of Dressings, Technique of an Aseptic Operation, Aseptic Injection, and Asepis in Private Practice.

The historical and past traditions are so mingled with the modern methods advocated that unless one is thoroughly conversant with the subject he is likely to be confused.

The chapter on the Renewal of Dressings is an excellent one. The apparently unimportant details of the book will be found by the house-surgeons of our hospitals and the medical student through the last of his course to be of a very great value. It is difficult to find, except in this little manual, these details of treatment carefully dealt with.

C. L. S.

The Treatment of Wounds, Ulcers, and Abscesses. By W. Watson Cheyne, F.R.S. Philadelphia: Lea Bros. & Co., 1895.

As the title indicates, the author discusses only a portion of the subject of the treatment of wounds in this most interestingly written book. The idea suggested at page 4, that there is in the healing process anything resembling an inflammatory process, is quite at variance with the most advanced pathology of repair.

The book is written entertainingly, and is of great value to the student in that it considers questions which are constantly coming up to him during his service as dresser and hospital interne.

There is comparatively little new for the surgeon in active practice.

C. L. S.

PROGRESS
OF
MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD W. WILCOX, M.A., M.D., LL.D.,

PROFESSOR OF CLINICAL MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

ANTIPHTHISIN.

DR. CHARLES DENISON does not consider that this remedy is absolutely perfect, nor the technique of its administration as unquestionably determined. It is made directly from the ten-times-concentrated culture-fluid of tubercle-bacilli, the toxic principles which tuberculin contains being excluded. It is thus claimed to represent the probable germicidal property of tuberculin, as much as exists in an equal quantity of the latter, and its special value depends upon the fact that a larger dosage is allowable without the injurious toxic effects to be expected from large doses of tuberculin. The germicidal and healing effect seems to have been shown, in most of the cases, in the lessening of the number of germs found to the field, and their degenerative or incomplete forms thrown off when good-sized doses were reached, as well as in the clearing-up of consolidated or infiltrated tubercular lung-tissue. The substance is not wholly without reactive effects, nor are we quite sure of its exact constituents and their constancy. There is probably a stimulating effect, and that produces an increased leucocytosis. It may be that a limit to the good which this remedy may accomplish in a given case might perhaps be assumed to have been temporarily reached when this process is found to be overtaxed or to have been arrested, as shown by the paucity of leucocytes, and these swollen or granular when demonstrated by microscopic examination with high-power lenses. If this supposition is correct, it may be that we may anticipate greater success by combining or alternating with it something else which will foster or increase leucocytosis.—*New York Medical Record*, 1895, No. 1289, p. 78.

PARACHLOROPHENOL.

DR. CH. GIRARD states that this drug is crystalline at ordinary temperature, has an odor similar to phenol, and is very soluble in alcohol and ether,

although but slightly in distilled water, which takes up only 1.3 per cent. With the addition of a small quantity of alcohol a 2 per cent. solution can be obtained. It coagulates albumin, as does phenol, but not completely. According to Karpow, in 2 per cent. solution it is a little less energetic than corrosive sublimate one *per mille* against the spores of anthrax, but is incomparably more active than 5 per cent. solutions of phenol or cresol. It is much less poisonous than the substances above mentioned. The urine of the animals used for experiment, even exposed to the air, remained for a month without odor or any sign of putrefaction, the coloration only becoming more pronounced. From the experience of this antiseptic in about two hundred operations the following conclusions are reached: In from 1 to 2 per cent. solutions it is the most energetic antiseptic which organic chemistry furnishes; it is of definite chemical combination, and in solution is colorless, or almost so, and its odor is less disagreeable than other phenol or cresol derivatives; it can be used for the disinfection of the hands and instruments as well as the usual antiseptics.—*Revue Médicale de la Suisse Romande*, 1895, No. 7, 365.

Cocaine-anæsthesia.

M. André Lapointe states that safety demands that local anæsthesia by means of this drug should be produced only when the following rules are observed: 1. Only fresh 1 per cent. solutions prepared aseptically should be used. 2. A sterilized syringe of 15 minims capacity is used. 3. The maximum dose of the alkaloid is 2½ grains. 4. The patient should be operated upon in the recumbent position. 5. The operation should be commenced not less than five minutes after the last subcutaneous injection. 6. If there is need, the anæsthesia should be made upon several superimposed planes. [This refers to deep-seated abscesses, tumors, and ligations.] The vaso-constrictor power of the drug well explains the cerebral anæmia and syncope which are encountered in cases of poisoning.—*La Presse Médicale*, 1895, No. 35, p. 273.

Static Electricity.

Dr. Julius Althaus believes that this form of electricity has again found favor, and is a very useful addition to the electric instrumentarium. The modern machines yield a plentiful supply of electricity independently of the weather. It is chiefly used as a dry bath, the patient being charged while on an insulating-stool; at the Salpêtrière with positive electricity several hours a day. It may be also applied by drawing sparks from round conductors; as the electric wind, or breeze, or douche, when a pointed conductor is approached to those which are intended to be acted upon; or a metallic cap, connected with a conductor, is held at a certain distance from the head. A discharge intermediate between the wind and spark is produced by the so-called "electric aigrette" when a blunt metallic point or piece of wood is approached to the patient's body. This is particularly useful when a sensitive part is to be acted upon or as preparatory to stronger treatment of timid patients. A "static current" has been employed by passing an uninsulated ball rapidly over the clothing of the patient. These different methods can produce a mixture of stimulant and sedative effects

upon the system, which may be utilized in the treatment of certain neuroses, as hysteria, hysteroepilepsy, insomnia, and obstinate forms of neuralgia and spasm. Morton has used the "static current" in locomotor ataxia and other degenerations of the spinal cord with apparent benefit. As ozone or electrified oxygen is developed during the action of the Franklinic machine, the patient may be made to inhale it by holding an insulated disk with a number of points at some distance from his mouth. This proceeding has been found to be useful in certain forms of anæmia and spasmodic asthma. —*Medical Press and Circular*, 1895, No. 2924, p. 533.

Acute and Chronic Copper-poisoning.

Herr Wilhelm Filehne notes the many opportunities for the ingestion of this metal, which gives rise to chronic poisoning. In guinea-pigs there were observed loss of body-weight, particularly anæmia of all tissues and organs, swollen spleen, small and fatty liver, anæmic kidneys, pale gastric mucous membrane, the intestine, beyond pallor and possibly some swelling of the plaques, normal; in doses which do not give rise to emesis, copper in the combination with potassium tartrate may be dangerous to health, and, as this double salt may contaminate wines, this communication becomes important. In 1889 Dauscher reported a case of poisoning from this source in which the symptoms were gastric pain, fainting, tenesmus, muscular twitching, and, later, jaundice; the last two symptoms being especially significant of the cause of the poisoning. Further observations are necessary to determine the amount of the metal which will give rise to poisonous symptoms.—*Deutsche medicinische Wochenschrift*, 1895, No. 19, S. 297.

Ether-anæsthesia.

M. Chaput states that (1) it is less dangerous than chloroform; deaths from the former 1 in 13,000, from the latter 1 in 2000. (2) It can be produced in from four to six minutes, therefore being more rapid. (3) It is very easy, and thus can be intrusted to a very ignorant person. On the contrary, a good chloroformist is very rare. (4) It strengthens the heart-beat and does not conduce to shock. (5) It has less effect upon the kidneys than does chloroform. (6) It causes vomiting only exceptionally. (7) The patients awake easily and quickly and are much less depressed. Ether is contra-indicated in acute or chronic affections of the respiratory apparatus, in operations upon the face or in those which necessitate tracheotomy, and in cerebral surgery. The mask of Wanscher is preferred to that of Julliard in that it is smaller and less cumbersome, allows inspection of the face and eyes, and easily graduates the amount of air.—*Journal des Praticiens*, 1895, No. 19, p. 299.

M. Poncet has used ether during twenty-five years in from twenty-three to twenty-five thousand cases with but a single death; a child who suffered from a cardiac lesion. The immediate accident with ether-narcosis is suffocation, but it is one which is amenable to treatment either by artificial respiration or tracheotomy; the last he has resorted to with success four times. The contraindications are early and old age, both for the same reason—the

liability to pulmonary catarrh. Nor should ether be used in operations upon the face or at night (danger of fire). Mixed anæsthesia—that is, chloroform preceded by injections of morphine and atropine—has been discarded because of its dangers. With ether the dangers are easily detected and combated; with chloroform the reverse is true.

M. CHAMPIONNIÈRE states that ether can be annoying to the surgeon in that he may exhale its vapor for twenty-four hours. The anæsthesia is less perfect, the after-vomiting is as frequent, and the secondary excitement more persistent, and it gives rise to great thirst. On the other hand, the dangers are less grave, its elimination easier, and the anæsthesia is quicker.

M. QUENU employs ether for short operations and for patients with broken-down nervous system.—*Journal des Praticiens*, 1895, No. 22, p. 346.

[While in the main the views expressed above are correct, we are strongly of the opinion that renal disease is a valid contraindication to the use of ether, and that in this instance chloroform is preferable.—R. W. W.]

SOME NEW VASO-DILATORS.

DR. J. B. BRADBURY has investigated erythrol and mannitol nitrates; also those of the sugars: dextrose, levulose, and saccharose nitrates. These are less soluble than other nitrates, and therefore have a correspondingly weaker effect, but their action is more prolonged. Considering the first two named above, their therapeutic indications can be given as chiefly when the heart is laboring under increased work imposed upon it by contracted arteries. The difficulty hitherto has been not so much to reduce arterial tension as to keep it constantly below a certain level. Both nitroglycerin and sodium nitrite have been used, but their administration has been attended with some inconvenience, notably that their action is so transient that the doses must be repeated at two-hours' intervals in order to produce continuous low tension. On the other hand, with the substances above named, the tension is not brought so low, but the reduction is of longer duration and the pressure is less liable to fluctuation. Further, they are free from poisonous properties, a quality readily explained by their slight solubility. The conditions under which these remedies may be used are cardiac pain, chronic Bright's disease, aneurism, Raynaud's disease, dyspnœa, headache, nervous diseases, as migraine and neuralgia, and various forms of poisoning, as from opium and coal-gas, vomiting from pregnancy and sea-sickness, lienteric diarrhœa, diabetes mellitus, and hysterical paralyses. The dose of the solid organic nitrate may be taken as one grain, but more may be given if necessary in pill, tablet, or in alcoholic solution. The latter is preferred; of the erythrol nitrate, 1 to 60 aqueous solution, in drachm doses. Of the mannitol nitrate, 1 to 100 aqueous solution, in dose of from one and a half to two drachms. Both solutions, thus made, are stable and free from irritating properties.—*The Lancet*, 1895, No. 3768, p. 1205.

THE PHARMACOLOGY OF THE IPECACUANHA-ALKALOIDS.

DR. ROBERT B. WILD, from his observation, sums up the action of cephæline and emetine hydrochlorides as follows: Both possess a powerful emetic

action; the emetic dose of the latter was, however, about double that of the former. In non-emetic doses the degree of nausea produced by cephæline was also about double that produced by emetine; *e. g.*, the intensity and duration of nausea following cephæline were much the same as that following double the amount of emetine. Both alkaloids lowered arterial tension, and little difference was apparent in small doses, but the depression produced by cephæline was less than that produced by the larger emetic dose of emetine; cephæline appeared, therefore, to be distinctly preferable where a non-depressing emetic was desired. Both alkaloids caused contraction of the bloodvessels after destruction of the brain and spinal cord, but emetine was distinctly more active than cephæline; 1 in 10,000 of the latter produced little if any effect, while 1 in 20,000 of emetine was followed by marked contraction. On the heart no appreciable difference could be made out, both produced slowing, weakening, and diastolic arrest of the isolated organ; recovery was easily effected when the poison was removed. It is doubtful whether the drugs in the doses administered to man could affect the heart directly, but the fact that 1 in 20,000 caused diastolic arrest in forty-six minutes renders caution necessary in giving large doses of the alkaloids. Both acted as muscle-poisons, but cephæline had the greater toxic power, and also caused irritation of the motor nerve-endings and contracture. On the secretions, salivation was well marked whenever there was nausea. Emetine caused a flow of watery mucus from the nasal mucous membrane when a full dose was given; this was not noticed after cephæline. It is possible that the expectorant action of ipecacuanha is due to a similar action of emetine upon the other portions of the respiratory mucous membrane. Intestinal peristalsis and a loose motion at times followed the administration of either alkaloid; there was never any marked purgation. No effect was noticed upon the secretions of the skin, nor upon the amount of urine. Assuming the view that emetine is methyl-cephæline to be correct, the chief effect of the addition of the methyl group was to reduce markedly the action of the compound upon the convulsive or vomiting centre in the medulla oblongata, and also to diminish the irritating effect on motor nerve-endings. The methyl compound had, on the other hand, a more powerful action as a local vaso-constrictor. It seems probable that in cephæline we have a powerful and certain emetic, singularly free from depressing effects when given in doses of from one-twelfth to one-sixth of a grain; its action is, however, too slow to prove of much service in cases of poisoning, but in all other cases where emesis is desired it appears well worthy of trial. In acute catarrhal and febrile conditions as an expectorant, and for all the uses of ipecacuanha when vomiting is not desired, emetine in small doses seems likely to prove of considerable value, and also as an emetic in larger doses, from one-sixth to one-third of a grain, when a more depressing action is required. The powerful local constricting effect upon bloodvessels may also prove useful in hyperæmic and inflammatory conditions.— *The Lancet*, 1895, No. 3769, p. 1274.

Anti-streptococcus Serum.

Dr. George G. Van Schaick reviews the literature and states that the immunization of animals by means of toxins taken from ordinary cultures

have hitherto given variable and rather uncertain results. The use of exceedingly virulent cultures has enabled us to immunize animals and obtain an antitoxic serum of great activity. This streptococcus antitoxin possesses a high preventive power in animals. The frequent association of diphtheria with streptococcal infection has suggested to French experimenters the propriety of preparing a serum having antitoxic properties against both the [Klebs-]Loeffler bacillus and the streptococcus by immunizing the same animal against both poisons. Further, it has been shown that animals which had already been immunized against diphtheria possess a remarkable degree of tolerance against streptococcal infection. Marmorek has treated with streptococcus-antitoxin 411 patients suffering from streptococcal infection in various forms, with a mortality of 3.4 per cent. In erysipelas, with sufficient dose, relief was felt in from five to twelve hours after the administration of the first injection, headache and muscular pains are lessened, and sleep is restored, the temperature is lowered more or less rapidly. If it should not decrease within twenty-four hours, the injection must be repeated. Two or three hours after the injection there is a rise of temperature, which is again rapidly lowered, reaching the normal within twenty-four hours. When the intervention is practised early, a single injection seems to abort the disease. If the disease is further advanced, the fever disappears more slowly, and proves especially tenacious in ambulant erysipelas, usually necessitating repeated injections. The local state becomes ameliorated more or less rapidly according to the severity of the infection, the time at which the injection is made, and the quantity of serum employed. In some patients seen at the beginning, the redness disappeared, and in three hours the desquamation started. The latter occurs rapidly and in large shreds. Suppuration in the neighborhood of the disease rarely occurs. Albuminuria, frequent in this disease, is not seen in those patients who receive the serum at the inception of the disease, and in those who have been treated twenty-four to forty-eight hours after the beginning it disappears very rapidly. Two forms of erythema have been occasionally observed, one is urticarial and the other resembles purpura, but is not associated with any febrile movement.—*Therapeutic Review*, 1895, No. 3, p. 74.

The Treatment of Diabetes.

Dr. J. Blake White inclines to the conviction that diabetes should be classed among the neuroses, and that its varied phenomena result by reflexes from the nervous system, just as shock may temporarily arrest the secretion of urine. The disease obviously arises in the sympathetic chain which controls the secretory functions of the kidneys. A judicious restriction of diet should be insisted upon, and fats in the form of butter, cream, and fresh milk should be permitted, and sometimes it is advisable to give cod-liver oil, the form of emulsion being best suited to the pancreatic complication of the disease. As an assimilable form of saccharine substance, levulose has been recommended. The saline purgative and alkaline non-purgative waters are serviceable to diabetics; the former by reducing saccharine supply by removing from the intestines ingested food before it has had time to be absorbed and furnish the liver with material for the manufacture of sugar; the

latter act as any alkaline medicament in emulsifying fatty foods and rendering them easy of digestion. From internal antiseptics most beneficial results have been obtained, the remedy most commended being benzoyl-guaiacol given in capsules, commencing with a moderate dose of a grain or two and gradually increasing it to ten or fifteen grains thrice daily. This drug apparently stimulates the nerve-centres; it increases the appetite; it lowers the specific gravity of the urine; it controls the excretion of urine; and, lastly, it modifies the sugar-formation, thus lessening the amount excreted. In addition, the use of lithium carbonate and Fowler's solution gives the best results.—*American Medico-Surgical Bulletin*, 1895, No. 23, p. 1413.

Concerning Diaphoretic Methods.

Dr. Karl Dehio prefers the hot-air bath, administered in bed, in the manner familiar in American hospitals, because it brings about: (1) Extensive change in the circulation and distribution of the blood with lowering of blood-pressure. (2) There is an energetic abstraction of water through increase of perspiration. (3) There is a marked increase of tissue-change and increased expenditure of body-substance. The indications for its use are anasarca from renal disease, either post-scarlatinal or acute, acute anæmia, and chlorosis.—*St. Petersburger medicinische Wochenschrift*, 1895, No. 44, S. 373.

Phenacetin-poisoning.

Dr. G. Krönig reports a fatal case. For occipital headache a seventeen-year-old printer's assistant received five fifteen-grain phenacetin-powders, not more than two to be used in a day. After an evening-dose vomiting commenced, then were noticed great weakness and a bluish-gray coloration of face and lips. The temperature was 102.2° F., the pupils were of medium size, the pulse weak, and the patient complained of headache, vomiting, and diarrhœa. The urine was of chocolate color, the conjunctivæ slightly jaundiced. General icterus followed, and cyanosis of lips, ears, hands, and feet. Urine obtained by catheter was thick, dark reddish-brown in color, containing masses of almost pure blood. Death followed two days after the ingestion of the remedy. As the patient was septic from a purulent otitis, a necropsy was necessary to show that death was due to the drug. The diagnosis reached by this means was stated as universal methæmoglobinæmia, although the patient within the preceding three weeks had taken four similar doses with no apparent ill effects.—*Berliner klinische Wochenschrift*, 1895, No. 46, S. 998.

The Hæmostatic Properties of Antipyrin.

Dr. H. Huchard notes that as early as 1884 these properties had been noted, and it was suggested by Arduin that the drug might be used for the same purposes as iron perchloride and ergot. Its hæmostatic effects are powerful and rapid. In epistaxis a simple tampon moistened in a solution of the drug (1 to 5 or 1 to 2) is usually sufficient. In more extensive hemorrhages, hot irrigations with a 4 per cent. solution or even insufflations of the powdered drug are useful. For hemorrhages after ablation of polypi or ex-

traction of teeth these methods are applicable. In uterine hemorrhages, due to different causes, large irrigations with a 5 per cent. solution should be terminated by the application to the neck of the uterus of a tampon wet with the same solution. In hemorrhage due to endometritis fungosa, equal parts of salol and antipyrin are melted at the fusion-point of salol, which gives a brown, syrupy liquid, and this liquid is used to moisten a tampon which can be placed into the uterine neck, a speculum being used, and over it a few other tampons. After amygdalotomy moistened tampons are efficacious. For hæmoptysis, inhalations or sprays of a 1 per cent. solution have been effectual when other means, including subcutaneous injections of ergotin, have failed. For open wounds a solution or a gauze impregnated with the powder coagulates the blood, which resists for a long time decomposition, because of the antiseptic and cicatrizing properties of the drug.—*Journal des Praticiens*, 1895, 2e semestre, No. 19, p. 289.

The Absorption of the Albuminoids and Fats of a Nutritive Enema.

Dr. R. Lépine, reviewing the physiological literature, acknowledges that the question, whether absorption takes place in the large or small intestine, remains open, because the ingenious hypothesis of Grützner, that there is a retrograde transportation of fine alimentary particles without visible antiperistalsis, has not yet been established. If this should fail of proof, it is strongly probable that some of a nutritive injection could pass through the ileocæcal valve, and thus would be partly explained the fact that a patient can live and keep his weight entirely upon rectal enemata, for all that the large intestine does not show digestive phenomena which are hardly appreciable. Physiological observation shows that the ileocæcal valve is permeable, and it is only necessary for nutritive substances to penetrate a certain distance into the ileum to meet with digestive juices which can change them and render them absorbable.—*La Semaine Médicale*, 1895, No. 45, p. 389.

Izal.

Mr. Sheridan Delépine makes a laboratory-report upon this compound, which is comparatively insoluble and non-volatile at the ordinary temperature. It can be freely administered internally, used over extensive wounds, or injected under the skin without bad effects, and, finally, does not damage surgical instruments. The organisms upon which he has used this drug are: (1) bacillus tuberculosis (hominis); (2) bacillus coli communis; (3) staphylococcus pyogenes aureus; (4) bacillus anthracis (sporing-stage). Summing up the results of his observations he concludes that when diluted with 100 or even 200 parts of water it is a powerful and reliable antiseptic when contact of a sufficient length of time is secured. As an antiseptic it is more powerful than carbolic acid, and there is little doubt that it possesses immense advantages over it in many directions.—*The Medical Chronicle*, 1895, No. 6, p. 434.

[Izal is said to be a by-product obtained in the process of coke-formation. It is also known as Thorncliffe disinfectant.—R. W. W.]

MEDICINE.

UNDER THE CHARGE OF

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Hemiopia from Injury of the Occipital Lobe.

Cases of this kind are rare enough to make the following, reported by MEY (*Centralblatt für innere Med.*, 1895, No. 42), of unusual interest. A mason, sixteen years of age, fell from the height of two metres and struck the back of his head on the point of a trowel, causing a complicated fracture, with depression of a fragment of bone, a wound in the transverse sinus, and bruising the surface of the brain. The bone-fragments were chiselled out and the wound tamponed. The defect in the bone, the size of a "thaler," was in the right parietal region, at the junction of that bone with the occipital and temporal, and just above the transverse sinus, corresponding to the anterior part of the right occiptal lobe. The patient recovered from the injury, but within a few days began to have severe headaches with diminution of hearing and vision. The deafness disappeared in two weeks, but the difficulty in vision remained. The patient could only see with difficulty, soon tired on attempting to read, and the dimness of vision to the left of the patient was so marked that he had uncertain gait and dizziness. Examination showed complete absence of the left sides of the visual field, with concentric diminution of the right halves. The eye-ground was normal. The hemiopia remained, the diminution of the right side continued a short time and then gradually disappeared. The patient became able to walk and read. The transitory deafness and diminution of the field of vision are ascribed by the author to the circulatory disturbances following the fracture and the thrombosis of the transverse sinus, the hemiopia to the injury of the right occipital lobe, as produced experimentally by Munk and observed in cases of disease or injury since then.

The Diagnostic Value of Transillumination of the Stomach.

MEINERT (*Centralblatt für innere Med.*, 1895, No. 44) calls attention to the errors attending the diagnostic use of illumination through the stomach, for which MARTIUS and his pupil MELTZING have claimed more than most clinicians are willing to grant. As Meinert says, Meltzing failed to demonstrate that the figures produced by putting an incandescent lamp in the stomach are due to the shape, size, and position of the organ, rather than to the position of the lamp itself. Comparative tests were made by distending the stomachs of a number of patients, locating them by palpation, and measuring their capacity, then by illuminating them according to the method

of Meltzing. The results of these experiments demonstrate the truth of Meinert's contention, that the area of light shown by the lamp at the end of the sound is affected by the translucency of the intestines at the time, the intensity of the light, and the distance of the lamp from the abdominal wall. The diagnostic value of the procedure is therefore slight. Tumors in the splenic region, dislocation of the spleen, and the topographic relation of many palpable tumors of the stomach and its vicinity may be demonstrated by it, but the position, size, and form of the stomach are more likely to be wrongly than correctly decided by its means.

Intrauterine Typhoid Infection.

Freund and Levy (*Berliner klin. Wochenschrift*, 1895, No. 25) report the case of a pregnant woman in the middle of her gestation who had typhoid fever and aborted in the beginning of defervescence. The fœtus died as soon as the cord was cut. Twenty minutes later cultures were made from the fœtal organs with all necessary precautions, and in course of time colonies grew from the splenic and placental blood having all the characteristics of the typhoid bacilli. The fœtus had an enlarged and soft spleen, otherwise no abnormalities.

The Alternation of Dyspnœa and Venous Congestion in Heart-disease.

Zerner (*Wiener med. Blätter*, 1895, Nos. 7 and 8) calls attention to the fact that in cases of heart-disease the symptom of dyspnœa disappears when œdema and other evidences of venous congestion occur. This is explained by the theory of von Basch, according to which the causes of dyspnœa are distinct from those of stasis of the general circulation. The dyspnœa is the expression of pulmonary stasis from insufficiency of the left ventricle; whereas the stasis of the greater circulation is due to weakness of the right ventricle. If, during congestion of the lungs, stasis occurs in the greater circulation—*i. e.*, distal from the right ventricle—the amount of blood in the lungs must lessen and the existing dyspnœa decrease.

The Effect of Thyroid-feeding, Especially in Graves's Disease.

Scholz (*Centralblatt für innere Med.*, 1895, Nos. 43 and 44) has recently carried out some interesting observations on this subject which are of great importance on account of their bearing on the pathology of Graves's disease. Owing to the incompleteness of the observations only a few deductions can be given here. It seems established that in adults with normal thyroids the ingestion of "dead" thyroid causes a less marked effect on the excretion of nitrogen and on the weight than in myxœdema and obesity. In these respects a patient with Graves's disease reacted like a healthy person. There was diuresis, but a scarcely perceptible increase in the excretion of nitrogen in the urine. The weight increased to the extent of three kilogrammes in a week. The excretion of phosphoric acid in the urine was not increased by the use of thyroid-tablets, but there was an increased excretion of phosphoric acid in the stools amounting to tenfold the normal in the patient with Graves's

disease, as compared with an increase of 25 per cent. in a healthy person. This agrees with Roos, who found that in healthy dogs feeding with thyroid caused an increased excretion of nitrogen, sodium chloride, and phosphoric acid. If the animals are deprived of their thyroid glands, the effect of the substance on the excretion of nitrogen and chlorine is more marked than in healthy animals. The conclusion is, therefore, that the thyroid gland has an important influence on the metabolism of phosphoric acid. The following hypothesis is suggested: The failure of the function of the thyroid causes retention of phosphoric acid, while the morbidly increased activity, as in Graves's disease, caused increased excretion. In view of this and corresponding to it the beneficial results claimed by Kocher from the internal use of sodium phosphate are of interest.

Graves's Disease and Scleroderma.

Singer (*Berliner klin. Wochenschrift*, 1895, No. 11) reports a case of scleroderma in which the right half of the thyroid gland was found greatly atrophied during life, and post mortem both lobes showed marked sclerotic changes. This observation led the author to formulate a new theory of the nature of scleroderma. The combination of the latter disease with Graves's disease has been noticed especially by Leube, Kahler, and Jeanselme. The early changes in scleroderma have a great resemblance physically to those of myxœdema, and in both the subjective symptoms—formication, coldness, pain—are much the same. Graves's disease and myxœdema may be associated, and that both of them are due to changes in the thyroid becomes daily more certain. Singer suggests, therefore, that all three of these diseases are related, though he leaves open the question whether the changes in the function of the thyroid are primary or secondary. Although the question must be settled by anatomical and clinical observations, it opens a field for therapeutic experiments in the treatment of scleroderma with thyroid-preparations.

The Etiology of General Paralysis.

Hirschl (*Berliner klin. Wochenschrift*, 1895, No. 45) has obtained the following results and conclusions from an analysis of 200 cases. In 56 per cent. of cases there was a clear history of syphilis, in 25 per cent. it was probable, and in only 19 per cent. a history of syphilis could not be discovered. Soft chancres were not used in this investigation as proving the existence of syphilis. In 78 cases in which the time of infection could be fixed, the interval between that and the appearance of paralysis varied from two to twenty-nine years. The author thinks the cause of general paralysis is a single one, on account of the similarity of the symptoms and of the anatomic process, the latter being a diffuse encephalitis and periencephalitis. The question whether this cause is syphilis requires some explanation of the 19 per cent. of cases with negative histories. This the author disposed of by taking the histories of 63 cases with late syphilitic lesions and finding that in only 54 per cent. was there a history of syphilitic infection, in 9.5 per cent. it was doubtful, in 36.5 there was none at all. The anatomical changes in paresis were compared with those of syphilis, especially with the interstitial hepatitis of late syphilis. Finally, some of the symptoms of paresis were found

to occur in syphilis, such as reflex immobility of the pupil, double vision, optic atrophy, ophthalmoplegia, and tabes; the symptoms of general paralysis were claimed to be favorably influenced by antisyphilitic treatment and the prevalence of the two diseases was adduced to prove further their relationship. The paper shows what can be done with statistics.

Thyroidism.

Lanz (*Correspondezblatt für Schweizer Aerzte*, 1895, No. 22) has recently called attention to the need of a more precise understanding of the effects of the ingestion of thyroid gland and its preparations. Symptoms of intoxication due to the gland itself may be expressed, after many analogies, as thyroidism. Experiments show that different preparations vary much in their effects. Fresh glands are much less toxic than various preparations, so that some of the symptoms reported as following thyroid-feeding may be looked on as meat-poisoning. Nevertheless there are symptoms which may follow large doses of fresh thyroid, and so deserve the name mentioned above. These are: rapid increase of the pulse-rate with a rise, followed by a fall of the blood-pressure, emaciation, paresis of the lower extremities, and alteration of the mental condition. By overfeeding of pregnant animals with thyroid-preparations symptoms of thyroidism have appeared in the young—a fact of importance in human pathology and therapeutics.

Transfusion of Blood in Severe Chronic Anæmia.

Ewald (*Berliner klin. Wochenschrift*, 1895, No. 45) was called to see a man, aged thirty-two years, apparently in collapse. The history obtained then, and examinations made afterward, showed the case to be one of idiopathic anæmia, having many of the characteristics of the so-called pernicious form. The patient could not swallow, injections of camphor had no effect on him, and as a last resort, apparently a hopeless one, transfusion was practised. The blood was taken from the patient's wife, defibrinated, and injected into the median vein to the amount of about 85 c.cm. Anæsthesia was not necessary. The patient's pulse and breathing improved slightly after the transfusion, but injections of ether and camphor were necessary throughout the following night. On the second day after that strength gradually returned and the patient became convalescent. On the third day the blood showed 1,250,000 red corpuscles and 29 per cent. of hæmoglobin. There were few polynuclear leucocytes, no nucleated red corpuscles, very few eosinophile-cells. There were hemorrhages in the retina. The blood after two weeks showed 2,300,000 red corpuscles and 33 per cent. of hæmoglobin. Five months later the hæmoglobin was the same, the red blood-corpuscles 3,500,000 to the c.cm.

After discussing the clinical and pathological features of the case—which he does at some length—Ewald inclines to the opinion of Hunter, that pernicious anæmias are due to autointoxication caused by changes in the gastro-intestinal tract. In view of our present knowledge of autointoxication and antitoxins Ewald raises the question whether, in such cases as the one just cited, the injected blood has not some antitoxic action, so that a poison circulating in the body becomes neutralized or destroyed by it, and so gives the body time to gain new strength.

In addition to the transfusion and after it, the patient was treated by arsenic in various forms, quinine, iron, hydrochloric acid, and a combination of resorcin, bismuth-salicylate, and benzo-naphtol. Meat was but sparingly used in the diet.

The Action of the Leucocytes under Certain Poisons.

Chatenoy has recently made a series of experiments to determine the effect of certain poisons on the leucocytes in vaccinated and non-vaccinated animals.

The poisons chosen were vegetable (ricine and abrine), bacterial (diphtheria and tetanus), and animal (snake-poison). The results from all varieties were the same.

In all cases there was a distinct leucocytic reaction, varying according as the animal was in the process of immunization, was already vaccinated, or had undergone no immunizing process. The animals undergoing vaccination showed all through the course of the process a distinct leucocytosis, which diminished progressively as the process of immunization proceeded.

Vaccinated animals submitted to fatal doses showed more or less reaction according to the degree of immunity conferred on them. In most cases there was a slight leucocytosis, though some showed practically no increase in leucocytes. In none of the cases was there any appreciable decrease in the number of leucocytes. Non-vaccinated animals, when submitted to a rapidly fatal dose, constantly showed a decrease in leucocytes. When submitted to a dose more slowly fatal, the number of leucocytes oscillated a good deal, but there was always a leucocytosis at the time of death. The author regards a progressive and regular leucocytosis as a favorable prognostic sign, a progressive decrease in the number of leucocytes as an unfavorable sign, whilst oscillations including both increase and decrease are to be regarded as signs of slow, but certain death.—*Le Progrès Médical*, October 12, 1895.

Two Unusual Cases of Hysteria.

Hector W. G. Mackenzie reports (*Clinical Society's Transactions*, vol. xxviii.) the case of a woman, aged twenty-three years, who had contracture of the legs for two years. Before this she had a long history of gastric and intestinal disorder, supposed at one time to include gastric ulcer, but in view of the later history evidently neurotic. Later, after some disappointment, the patient became paraplegic, with contracture of the legs. There was extreme emaciation; the legs could be perfectly flexed, but could not be extended beyond a right-angle at the knees. The deepest anæsthesia did not relax the contraction. The knee-jerks were absent, the muscles of the thighs and legs much atrophied, their electrical reactions normal. There was great mental depression, no anæsthesia or analgesia, but painful spots were usually present. Convulsions, bloodspitting, and other hysterical manifestations confirmed the diagnosis.

Under treatment by massage, liberal diet, and later, active motion, the contractures disappeared and the patient became completely restored to health, though with occasional attacks of nervous vomiting.

Besides the unusual character of the contractures in this case and its recovery, the report is of great value because the successful treatment was carried out in the general ward of a hospital.

The second case was one of hysterical deafness. (*Transactions of the Medical Society of London*, vol. xviii.). A girl, aged sixteen years, had an attack of sore throat, without any of the usual sequels of diphtheria. Two months later she had a mild attack of influenza. Shortly after that earache, to which the patient was subject, came on. "The Doctor blew up the left nostril with a Politzer. The girl screamed, and from that moment was extremely deaf. The Doctor said he had perforated the ear and the result was not what he anticipated. For some days the ear discharged copiously a green fluid." Three weeks later paralysis and anæsthesia appeared and became almost general, with deafness and aphonia. The general condition was extremely low. After eighteen months, by means of re-education of the muscles, the paralysis was cured. The deafness was complete in the right ear. A watch could be heard when held close to the meatus of the left ear, and words slowly spoken through an ear-trumpet could be understood. Bone-conduction was impaired to the same extent; examination by the speculum was negative. Education of the hearing was then tried, as suggested by Dr. Maximin Gilles, of Marseilles, everything else having failed. "The patient was made to listen to and to count the ticking of a clock at increasing distances, to listen to and to attempt to repeat words and sentences spoken first close to the ear and then at greater distances." Under this treatment the patient rapidly regained the sense of hearing and improved more rapidly than before in every respect. A *résumé* of the literature of hysterical deafness prefaces this interesting account.

Excessive Intestinal Putrefaction.

A very important paper has recently been published by Herter and Smith on the subject of excessive intestinal putrefaction and its relation to various diseases. The fact that in certain cases of epilepsy the seizure seemed to depend on excessive intestinal putrefaction led the authors to investigate the relation of this process to various other diseases.

The authors base their evidence of excessive intestinal putrefaction on the presence of certain substances in the urine in excess, namely, the ethereal sulphates, and adduce abundant proof to show that the excess of ethereal sulphates is indicative of excessive intestinal putrefaction. The index of the excess of ethereal sulphates is the ratio between these substances and the preformed sulphates. The presence of indican, as indicated by the indigo-blue test, is also used as a test of excessive intestinal putrefaction.

The relation of the intestinal process to several morbid states has been studied, but more especially its relation to the so-called intestinal indigestion.

The authors comment upon the vague and unsatisfactory descriptions of this disease in the text-books and other sources of information, and state that they have observed two varieties of the disease.

The distinction between the two classes of cases is based upon the relation of intestinal flatulence, which they consider the most characteristic symptom of intestinal indigestion, to the amo unt of indigo-blue determinable in the urine. The two varieties are:

1. Cases in which there is flatulence, and usually only a moderate amount of indigo-blue, and in which the indigo-blue disappears from the urine when the flatulence is removed by appropriate dieting.

2. Cases with or without continuous flatulence in which there is a large amount of indigo-blue in the urine, and this amount is not appreciably changed by the relief of the flatulence.

The difference between the two varieties of cases is explained on the ground that in the first variety the food alone is at fault, and that when food not subject to putrefactive changes is taken the symptoms cease. In the second variety of cases it is assumed that there is present a permanent pathological condition of the intestine concerned in the production of indol, perhaps a catarrhal condition with mucus-formation, for, as has been shown, mucus is particularly liable to decomposition into indol.

Abnormalities in the feces was another symptom observed as indicative of intestinal indigestion, as the authors state no fixed relation has been proved between these abnormalities and excessive intestinal putrefaction; but further study is necessary. Clay-colored stools and the presence of large quantities of fat in the stools were frequently met with where indican was present in the urine.

In a majority of the cases abdominal pain was present, generally associated with flatulence, and at times with distention; sometimes it was spasmodic and migratory, then usually occurring in the lower zones of the abdomen, and again it was fixed and epigastric. In the latter case the authors come to the conclusion that it was not actually dependent on excessive intestinal putrefaction. A feeling of emptiness was another common symptom, at times possibly due to an empty stomach, but in other cases certainly not dependent on this, as it was not relieved by food. The feeding did not bear any direct relation to excessive intestinal putrefaction.

The only remaining local symptom of intestinal indigestion was nausea. This was at times relieved by a diet such as would check excessive intestinal putrefaction, but at times seemed to bear no relation to this process.

Of the general symptoms malaise, lassitude, involuntary muscular twitchings, flushing of the face, cold extremities, etc., were the most important. As the authors point out, these are the first symptoms of neurasthenia, and they do not doubt that many cases of neurasthenia are originated from or complicated by intestinal indigestion.—*New York Medical Journal*, June-July, 1895.

Intermittent Pediculosis.

De Vevey cites two interesting cases of intermittent pediculosis in human beings. The subjects were both individuals who had as pets members of a certain monkey-tribe (macacus cyoamalgus). In both patients some disease was present which produced a daily exacerbation of temperature. Both patients observed that at the time of the febrile attack they were seized with intolerable itching, which promptly disappeared with the disappearance of the fever.

The examination of the patients at the time of the itching-attacks revealed the fact that they were covered with lice of the variety commonly found on the species of monkey above mentioned; during the period of apyrexia abso-

lutely no lice were to be found. The itching never appeared until the temperature had reached 38.5° C.

This invasion of the human body by monkey-lice during febrile attacks indicates that the conditions regulating this form of parasitism have perhaps more to do with the temperature of the affected species than with special peculiarities. The author holds that the parasites must certainly have found favorable conditions for life in these cases, as the nits of the lice were found attached to the pubic and axillary hairs.

The author thinks that these cases may help to explain certain historical ones, where dead individuals were so suddenly invaded by lice that they were supposed to have generated from the corpse. As the author remarks, the hygienic conditions in those days left much to be desired, and no doubt, in many instances, the individuals died with elevated temperatures.—*Comptes Rendus de la Société de Biologie*, November 1, 1895.

SURGERY.

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A CONTRIBUTION TO THE SURGERY OF THE HYPERTROPHIED PROSTATE.

RAND (*Annals of Surgery*, August, 1895) says that the operation of castration for the relief of hypertrophy of the prostate has been followed by a sufficient number of successful results to warrant even the most conservative surgeons in advising it in selected cases.

After a discussion of his results in operations by other methods, the author reports the two following cases in which he has performed castration:

CASE I.—The patient was fifty-eight years of age, and gave a history of having had more or less difficulty in urinating for ten or twelve years. Thirty-five years ago he had a single attack of gonorrhœa of moderate severity and short duration. For several years he had been told that he had hypertrophy of the prostate, and has had more or less incontinence, which has grown rapidly worse of late, so that for the past two years the dribbling of urine has been so nearly constant that he has been prevented from doing any active work. Five and a half ounces of urine were present at the first catheterization. His general condition was bad, and there were evidences of degenerative changes in his vascular system. He had not received even temporary relief from previous treatment.

Great difficulty was experienced in catheterization, owing to obstruction in the prostatic urethra; nothing, as a rule, but a long, curved, silver catheter could be passed. Length of the urethra about eight and a half inches. There was a stricture of large calibre in the penile urethra, and one at the bulbo-membranous junction, but it did not seem that they were responsible for any of his symptoms. An examination showed the lateral lobes moderately enlarged, the right a little more than the left. Small Van Buren's sounds were passed with difficulty.

Castration was accepted by the patient, and both testicles were removed February 24, 1895. He had been suffering from catheter-fever prior to operation. Highest temperature after operation, 101.4° F.; normal after third day. The catheter was passed every four or five hours to prevent soiling of the dressings. The house-surgeon found catheterization more easy each day, and soon was able to use a soft-rubber instrument. There was no pain whatever as a result of operation. The second day after operation he voided twelve ounces of urine voluntarily at different times during the day, and, while there was no noticeable increase in the volume of the stream, there was a marked diminution in the straining to which he had been so long subject.

The third night after operation catheterization was neglected, and he had some overflow. The following morning eight ounces were withdrawn, and during that day he passed it without assistance. Six days after operation the amount of residual urine had fallen to a half ounce. The day following there was none. At times, however, during the following week there would be more or less residual urine present.

On March 17th, eighteen days after operation, the first appreciable diminution in the lateral lobes was noticed, but that of the median portion was most marked, a sound passing into the bladder as though the former obstruction had been largely removed.

After going several days without catheterization, five ounces of residual urine were found, showing an atonic bladder.

On April 5th continuous improvement in his local symptoms could be noted. He felt as if his urine passed naturally, and had no straining whatever. Residual urine was generally absent or present only in small amount—an ounce or less. He had, however, considerable of his former inability to retain urine when once the desire came to void it. The interval between the acts of urination was growing longer—two hours, and at times three. Length of urethra seven and a half inches. Prostate as felt by the rectum much smaller, and a small-sized sound dropped into the bladder by its own weight.

Case II.—Patient sixty-nine years of age; had had for the past nine years frequent urination associated with straining and pain during the act; has urinated every two hours during the night and every hour during the day for the most of the past two years; exceptionally only every three hours. Straining has been constant, and has become progressively worse. He had never had retention of urine, and gave no venereal history. Has during the past year been losing weight, and has suffered much from loss of sleep. Sexual desire has been practically absent for some time. The length of the urethra was nine inches, and the bladder contained four ounces of residual urine. There was moderate enlargement of the median portion of the pros-

tate; the lateral lobes were at least double their normal size, and symmetrical in outline.

During the four months before operation there was at times some improvement, but it would be only temporary. The quantity of residual urine was at times six or seven ounces, and on the whole he had become so much worse that he asked for relief by surgical means. During the week immediately preceding operation he suffered greatly from frequent and painful urination, some nights every fifteen to twenty minutes. This, with the consequent loss of rest, was the only apparent causes for his elevation of temperature, which ranged from 100° to 101° F. for three days prior to operation.

The urine in this case was always acid in reaction, and contained only a small amount of pus.

Operation, May 18, 1895; both testicles were removed, and were found to be far advanced in cystic degeneration. Neither shock nor pain followed. The patient's temperature fell next day to 99.4° F., and was normal after the third day. The day after operation he passed at 8.30 A.M. four and one-half ounces of urine, and the same amount at 10 and 11 o'clock. After this last micturition there were found to be three ounces of residual urine. During the four following days he continued to urinate with less pain, and at from one to three hour intervals.

On the fifth day he passed voluntarily at 7 A.M. five ounces of urine; at 10.30 A.M., seven ounces; at 1 P.M., five ounces; at 3 P.M., seven ounces. At this hour three ounces of residual urine were drawn. His bladder was emptied by catheter at 10 P.M., and he urinated only once between this time and 5 A.M. the following day.

The eighth day after operation the patient had improved greatly in appearance, and looked less careworn. He can see no change in the volume or force of the stream, but straining in voiding urine has diminished more than one-half. Three ounces of residual urine were withdrawn at 10 o'clock the previous night, and he slept till 3 A.M., five hours, and then again two hours. There is no change in the length of the urethra, but examination by the rectum shows marked diminution in the size of the right lobe and appreciable decrease in the left.

Eleven days after operation catheter passed at 11 P.M., and two and one-half ounces of residual urine were withdrawn. The patient did not pass water until 5 in the morning—a period of six hours—and not again until 9.30. During the day, when drinking freely, he urinates every two or three hours. The decreased size of the prostate at so early a date was a surprise, and the inequality of the two lateral lobes still more so. The author is quite sure such an inequality did not exist prior to operation, for he made several rectal examinations. He believes no further comment is required. The facts as stated speak for themselves.

A Contribution to the Studies of Vesical Myoma.

In a comprehensive and interesting article on this subject, Terrier and Hartman (*Rev. de Chir.*, March 10, 1895) say of intravesical myomas that their diagnosis is easy. They betray their presence by a combination of the ordinary symptoms of vesical neoplasms and the physical signs of a tumor

which recalls a uterine fibroma in all its characters of form and consistency. Hæmaturia is one of the most frequently observed symptoms; it was found wanting in but three cases out of eleven; its amount is variable. In general the hæmaturia is intermittent, often accompanied by clots which are sometimes the cause of retention; in many cases it has been noted that it follows intravesical examinations.

More often this hæmaturia is accompanied or followed by other complications—frequent urination, pressing and painful and sometimes difficult; some patients complain of perineal and hypogastric pressure.

Intravesical exploration, although in some cases giving no result except a return and increase in the amount of hæmaturia, permits usually the recognition of a tumor; in the other cases it is probably the volume and hardness of the tumor which make its recognition impossible.

Hypogastric palpation, the vaginal or rectal touch, and especially bimanual palpation, make possible a recognition of the form, volume, consistency, and mobility of the tumor. The tumors are round or lobulated, hard or soft. In combining bimanual palpation with the introduction of a vesical sound, it is very often possible to determine whether the vesical trigone is intact, the sound passing between the fingers and the tumor.

Treatment. Eccentric myomas follow the general rules of abdominal surgery. In the intravesical tumor the surgeon is guided by the practice habitual to the ablation of intravesical tumors.

The advantages of suprapubic cystotomy for vesical tumors, established by Professor Guyon for the removal of tumors of large volume from the bladder, are applicable to these tumors.

In voluminous tumors it is better, rather than to enlarge the abdominal wound, to remove the tumor piecemeal, beginning at its centre and progressing toward the periphery.

This is the practice of Neumann, and one which the authors employed at the time of the removal of a recurrent tumor.

The Treatment of Infected Wounds by Wet Dressing.

As far as we know at present, from experimentation and clinical observation, according to Steinmetz (*Deutsche Zeit. für Chir.*, 1895, Band xli. Heft 1-3), the disinfection of wounds by antiseptics will not always protect the tissues from the spread of the infection. There is no doubt that antiseptic solutions employed in sufficient strength to destroy totally bacteria harm the tissue-cells, and thus hinder the healing process in the wound. The antiseptic dressings must be changed daily to prevent collections of purulent matter beneath them. The usefulness of these dressings is, therefore, at least doubtful and uncertain.

The author having observed an equally beneficial action from weak boric-acid moist dressings and those of 1 : 1000 bichloride solution, inferred that the action was due to the moist heat, and not to the antiseptic. His experimental studies bring him to the following conclusions: In wounds infected with staphylococci in dogs no beneficial effect is observable from the action of moist warmth; its action is rather harmful, since infection, if protected from further addition from without, has a tendency to become localized, to

become smaller, and to heal, while under the influence of moist warmth it spreads out and takes on a more harmful character (necrosis). Moist warmth has no injurious action on sound tissues and produces no tendency to suppuration, for instance, in fractures where staphylococci are present in the circulating blood; upon infected tissue, however, it acts injuriously, tending to aid the spread of inflammatory and suppurative processes.

The harmful influence cannot be readily observed in transient suppurations where there is a daily changing of dressings, and the pus is not allowed to remain in the wound as it collects.

Alveolar Sarcoma of the Right Kidney in a Child Six Years Old.

Kopal (*Prager med. Wochenschrift*, 1895, No. 19) reports a very interesting case of an enormous alveolar sarcoma of the right kidney, which extended from the right hypochondrium upward to the liver, downward to within three finger's breadth of the symphysis pubis, to the left to within an inch and a quarter of the median line, and on the right continuous with the lumbar muscles. The patient was thin, anæmic, with normal heart and lungs, had slight fever, and complained of marked pain in the abdomen. There was no œdema of the lower extremities. The stools were retarded, and the amount of urine markedly decreased.

The tumor was removed by a laparotomy, the incision through the posterior layer of peritoneum passing externally to the mesocolon. Drainage was established by iodoform-gauze drainage anteriorly in the upper angle of the peritoneal wound and by a drainage-tube passed posteriorly. The recovery was feverless except for the first two days, when there was slight fever.

The amount of urine increased after the operation from 500 cubic centimetres per day to 1600, falling off again to 1200 to 1500. The specific gravity was normal, there was no albumin or crystalline constituents. There was marked arhythmia of the heart after the operation, which, however, produced no great inconvenience to the patient. The patient gained strength rapidly after the operation and increased in weight. The tumor probably arose from the central part of the kidney, and was an alveolar sarcoma larger than a child's head.

The author believes that such cases should be subjected to operation so long as they have formed no metastases in other organs, and so long as the strength is one-half normal and a careful examination of the urine shows no pathological nephritic changes. The size of the tumor and the age of the child are not direct contraindications to operation.

Gastrostomy by Frank's Method.

After an extensive experience with other methods, Lindner (*Berliner klin. Woch.*, 1895, No. 8) believes that Frank's method is capable of producing the best results. In the nine cases which he has operated upon all the patients lived over the first week, although the operation was performed for malignant disease, showing that the operation itself is not more harmful than that by older methods. Its other advantages are the greater retentive

power of the stomach and the absence of excoriation from overflow, and consequent necrosis of the edges of the wound and sloughing out of sutures. There is also no tendency to gradual dilatation of the fistula as in other methods. Of the nine cases, one operated upon *in extremis* died from peritonitis following necrosis of the mesentery, which had been included in the suture by oversight, eight days after operation. Two others died of pneumonia and bronchiectatic processes with putrefaction ten and twelve days respectively after operation. Of the six patients who lived over the first week, four left the hospital 142, 20, 37, and 39 days after operation; one of these died at home shortly after returning there; another has not been heard from and is probably dead; the others are living over a quarter of a year after operation. The author believes that earlier operation in these cases is desirable, and that better results will be obtainable when the patient is not so weak before operation. The author believes that the stomach should be united to the peritoneum before the canal is formed and the fistula completed. In non-malignant stricture this method produces the best of results.

The Results Obtained by Kocher's Method for the Radical Cure of Inguinal Hernia.

The fact that no death occurred in the 220 cases operated on by this method and reported by Beresowsky leads Kocher (*Arch. für klin. Chir.*, 1895, Band l. Heft 1) to say that in a patient who has no lesion of a serious nature in any organ the radical operation for hernia does not endanger his life.

The results obtained by the use of deep-buried suturing of the inguinal canal are, in 84 cases, 74 healed by absolutely primary union and could leave the hospital without a truss on an average of ten days after operation. The 10 cases of secondary union required an average stay of thirty-four days in hospital. Sixty-four of the total number of cases were examined at a later period and 6 relapses were found; these cases, with one exception where suppuration had taken place along the line of suture, had been operated on by assistants. That is, all of the cases operated upon in a correct manner and healing aseptically were cured.

Forty-eight cases were operated upon by the author's verlagerung's method. In 38 primary union occurred, and in 10 there was suppuration with discharge of the sutures, and in some cases of the hernial sac.

These were the results of aseptic treatment. The author believes that in large clinics, where varied operations are performed, the proper combination of anti- with asepticism will produce the best results. There were, however, in 31 cases afterward examined only 2 cases of relapse, and these occurred where there had been a large amount of suppuration. This method, therefore, gives certain results in cases where aseptic healing is procured. The author believed that a part of the bad results was due to the torsion and bending of the sac in the operation, and has, therefore, modified the method of procedure; the operation is now as follows:

An incision is made extending the entire length of the inguinal canal and somewhat externally; it exposes the fascia of the external oblique muscle and divides the cremaster and infundibuliform fascia; the hernial sac is then carefully dissected and separated from the spermatic cord. An incision is

then made through the external oblique fascia externally to and in a line with the inguinal canal; through this opening a curved hæmostat is passed, guided by the finger in the inguinal canal, through the canal to the external abdominal ring in front of the cord. The end of the freed hernial sac is then grasped and drawn up through the canal out of the opening in the external oblique fascia, where it is rigorously extended.

The hernial sac is then, in contradistinction to the former operation, carried out laterally over the external oblique fascia in a line continuous with that of the inguinal canal above the external portion of Poupart's ligament. It is then fastened by three sutures, one including and closing the incision in the fascia of the external oblique. The remaining portion of the sac beyond the three sutures is excised. The canal is then closed by deep sutures, which, however, lie externally to the cord, which is carefully guarded during the operation.

In 29 cases in which this operation has been performed primary union was obtained twenty-seven times; in 2 cases local suppuration occurred, and the recovery required twenty-seven days, while in the other cases the patients were discharged in nine days. No relapse occurred in any of the 22 of these cases which were seen at a later period.

The author believes that these results make it not only right, but the duty of the doctor to advise radical operation in all cases of inguinal hernia in which there is no complication of excessive size, incarceration, or inflammation, and in which disease of other vital organs, weakness, and advanced age do not contraindicate operation.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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A Brilliant Method of Direct Inspection of the Larynx and Trachea.

Under the name of "Autoscopie" (*Die Autoscopie des Kehlkopfes und der Luftrohre*, Berlin, 1896) Dr. Alfred Kirstein details a new method of examining the larynx and trachea, upon which he has been working for some time and of which some descriptions have been previously given in the journals (*Berlin. klin. Wochenschrift*, 1895, No. 22; *Archiv für Laryngologie und Rhinologie*, Bd. cxi. Heft 1 und 2; *Therap. Monatshefte*, Juli, 1895; *Deut. med. Wochenschrift*, 1895, No. 38). The writer of this notice had the opportunity of seeing this instrument used upon a patient of his friend, Dr. Gleitsmann, in New York, and can therefore give his personal testimony as to the revelations it unfolds.

A long, strong spatula, semi-cylindrical in order to depress the middle

portion of the tongue longitudinally, is the essential requisite of the new apparatus. It reaches to the epiglottis, where its depressed extremity hugs the base of the tongue as it is drawn forward, bringing with it the epiglottis by traction upon the glosso-epiglottic ligament. The thorax and neck of the patient being bent forward, as they would be in leaning over a fence, for example, and the head being extended backward, an almost straight line can be drawn from a point in front of his upper incisor teeth to the anterior wall of the trachea. The space comprised between this plane and that of the posterior wall of the pharynx is utilized. The observer's eye must be considerably higher than the patient's mouth, in order to guide his vision downward along this limited space. A little metallic casing is slipped over the proximal end of the spatula where it joins the handle, converting this portion of the instrument into a tubular passage with a flat top, which prevents the patient's teeth and moustache from getting into the line of vision. The illumination is best secured by means of an electric lamp inserted near the top of the handle, whence its rays are projected through a prism placed above so as to refract the light along the line of the tongue-depressor. It thus brilliantly illuminates the posterior wall of the pharynx, the epiglottis, the posterior wall of the larynx and of the trachea, sometimes even to and including its bifurcation; and it discloses more or less of the anterior portions of larynx and trachea according to the anatomical relations of the parts, and the success of the instrumental interference in pushing the tongue and epiglottis out of the way of the rays of light.

In some cases a spatula is used which reaches over the epiglottis and presses that structure back upon the base of the tongue. This is chiefly for use in certain conditions under local or general anæsthesia. It will be at once understood, as freely expressed by Dr. Kirstein, that this method of illumination is applicable in only a limited number of cases, but that where it is applicable it will extend the usefulness of laryngoscopy beyond the limits of the ordinary mirror. This will be especially the case in lesions in the posterior portion of the larynx and trachea to which direct access can be obtained, and therefore instrumental manipulation be made easier of execution.

For further details we must refer the reader to the original sources mentioned in this summary.

Œdema of the Larynx.

Dr. F. E. Hopkins, of New York, has reported (*Medical Record*, October 19, 1895) a case of acute œdema of the larynx, and gives a summary of the views of various authors upon the subject.

An Irishman, about forty-eight years of age, 235 pounds in weight, an indulger in drinking-spirits and malt liquors, had a mild attack of influenza (la grippe) the latter part of January, 1895. Four days after apparent recovery he was attacked with acute amygdalitis and pharyngitis, which yielded promptly to treatment. Two days later the symptoms of acute œdema became manifest, involving the epiglottis to an intense degree, and most likely the aryteno-epiglottic folds, although they could not be disclosed. It was thought that tracheotomy was urgently necessary. Meanwhile hypodermatic injections of morphine, leeches over the larynx, followed by the application of a cold coil for three days, relieved the symptoms. Convalescence was slow.

The patient did not recover sufficiently to return to his business for two months after the beginning of the original attack.

Cysts of the Pharynx.

Cysts of the pharynx are rare, or, if not rare, are rarely recognized. A cyst of the rhinopharynx and a cyst of the oropharynx are reported and illustrated by Dr. Jonathan Wright (*New York Medical Journal*, 1895, No. 23), who also presents for comparison an admirable drawing from a microscopic section of the mucous membrane of the rhinopharynx of a newborn infant, showing the muscle-tissue, the lymphoid tissue, and the lymph-spaces.

Necrosis of the Middle Turbinate.

Dr. A. B. Thrasher, of Cincinnati, contributes a paper (*New York Medical Journal*, 1895, No. 23) upon this subject and refers to two of his own cases. One of these, a woman, had been suffering with intense pain in the left side of the nose, radiating over the same side of the face and the head. The projecting mass of an enlarged middle turbinate was severed with a cold snare. A third of the outer portion of the bone was entirely dead. After the adjacent ethmoid cells were thoroughly scraped the patient made a prompt recovery.

The second case was a male, twenty-eight years of age, with obstruction of nasal respiration, and suffering severely from supraorbital and infraorbital neuralgia of some two years' duration. On removal of bony tissue of the right middle turbinated bone a portion of it was found dead.

OTOLOGY.

UNDER THE CHARGE OF

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Hemorrhagic Exudation into the Drum-cavity.

Haug, of Munich, reports the occurrence of hemorrhagic exudation in the drum-cavity in conjunction with hemorrhagic otitis externa, due to the irritation following a pulpitis in a molar tooth. (*Archiv f. Ohrenheilkunde*, Sept. 1895.)

Purulent Leptomeningitis after Acute Otitis Media.

Joel, of Gotha, has observed purulent leptomeningitis following acute otitis media, with mastoiditis, after measles in a boy three years old. The post-mortem examination revealed no caries on the inner surface of the petrous bone, but pus was found filling the porus acusticus internus, and it was suggested that the pus may have found its way from the middle ear by the way of the facial canal. (*Archiv f. Ohrenh.*, Sept. 1895.)

BRIEGER (*loc. cit.*) has suggested puncturing the cerebrospinal cavity in order to decide whether, in addition to a brain-abscess, there is also present a complicating meningitis. The result is sometimes negative, though meningitis be present. However, even in such cases Brieger concludes that the surgeon may earlier decide to operate.

TREATMENT OF ACUTE OTITIS MEDIA AND SUPPURATIVE MASTOIDITIS.

HESSLER, of Halle, in a paper on the above-named subject (German Otological Society: *Archiv f. Ohrenh.*, Sept. 1895), states that in acute otitis media, when the membrane is imperforate, he makes a large curvilinear incision in the membrane extending from its anterior border beneath the malleus to the middle of the posterior periphery. *Syringing is strictly forbidden in all acute cases*, and the patient told to mop the ear gently with cotton as often as necessary to keep it clean. In no instance must the meatus be kept stopped with cotton, as such treatment favors retention of pus. *Inflation of the tympana in the acute stages is strictly forbidden, as this procedure may produce further inflammation by infection from the nasopharynx.* Boric-acid insufflations are also forbidden, as they become unnecessary as a prophylactic against *infection* from the auditory canal, if *syringing be avoided in acute cases.* If secondary inflammation of the mastoid occur, Hessler advises immediate chiselling, opening of the process by Schwartze's method, suggested for acute cases. By this means all cariously softened bone is entirely removed from the additus and antrum by means of the chisel, great care being exercised not to injure the auditory ossicles. The opening in the bone varies from five to eight centimetres. The wound should not be irrigated, but simply lightly tamponed with iodoform-gauze if there is no parenchymatous hemorrhage; if the latter occur, the wound may be packed more firmly with iodoform-gauze. According to the degree of moisture in the dressings should the latter be changed in one and a half to three days. At such a time any moisture may be mopped from the wound by long strips of sterilized gauze. The auditory canal should be left open. As iodoform-gauze hinders granulation, the later dressings should be simple sterilized gauze.

In the discussion which followed PANSE, of Dresden, agreed in the main with Hessler, but thinks that in no instance should patients be allowed to mop their ears with cotton nor use any form of instrument upon their ears, which they never learn to do aseptically. Panse places strips of iodoform-gauze in the auditory canal in cases of acute discharge, allowing the secretion to run into a bandage, which he changes as often as is necessary, and pursues this plan as long as the strip of gauze is moist as far out as the meatus.

BARTH, of Marburg, asserted that the plan of treatment recommended by Hessler has been employed in acute otitis media, in Lucæ's clinic in Berlin, for twelve years. [It is strange we have heard so little of so good a plan until Gradenigo and Pes and others have demonstrated that there is no other rational method of treatment in the light of our present bacteriological knowledge of the origin and course of infection of the middle ear in acute otitis media.]

STACKE, of Erfurt, states that for five years he has operated under strict asepsis, and avoids in acute otitic suppurations not only syringing, but also

rough mopping on the surgeon's part, and permits absolutely no treatment by the patient. Often one dressing of the ear will be sufficient to absorb all the secretion thrown into the auditory canal. After opening the mastoid cavity he prefers to keep the wound open in its outer portions in order to inspect the deeper parts as long as he may deem necessary.

LEUTERT, of Halle, stated that in Schwartze's clinic syringing is not done in acute otitis media. It is best, however, to keep the auditory meatus closed in order to prevent entrance of air.

BRIEGER, of Breslau, is in favor of dry cleansing with sterilized cotton-mops in acute otitis media. A tampon in the auditory canal cannot in his opinion lead to retention of pus; but retention of pus may easily ensue in the mastoid wound, if closure on the outer side is allowed before healing from the bottom takes place. Hartmann, of Berlin, has long ceased to employ inflation in acute otitis media, and has spoken against irrigation of the wound after mastoid chiselling. A bandage should be retained for a long period only in an aseptic wound, while in septic wounds the dressings should be changed as often as possible. Long-continued tamponing delays healing.

NOLTENIUS, of Bremen, does not think that tamponing the auditory canal with absorbent cotton or gauze after paracentesis will lead to retention of pus; after mastoid operations he considers it important to effect healing from the bottom.

REINHARD, of Duisburg, asserts that in the Schwartze-school irrigation is not practised in acute suppurations.

WALB, of Bonn, considers inflations by either Politzer's method or the catheter or any other method as not only useless but as really dangerous, as by such means pus may be forced into parts of the middle ear previously unaffected, as he pointed out six years ago, in a meeting of aurists in Heidelberg, and was unanimously indorsed by all present.

VARIOUS METHODS OF OPERATING IN OTITIC BRAIN-COMPLICATIONS.

At the fourth meeting of the German Otological Society, May, 1895 (*Archiv f. Ohrenh.*, Sept. 1895), KOERNER, of Rostock, and JANSEN, of Berlin, presented reports on the above-named subject. Koerner first draws attention to the fact that every intracranial suppuration does not always produce symptoms from which safe conclusions can be drawn as to its location. Autopsies, however, have shown that nearly all otitic brain-abscesses are situated near the spot of original suppuration in the ear or in the petrous bone, and often in demonstrable physical communication with it. Since nearly always when the abscess is in the temporal lobe the tegmen tympani et antri is diseased and the abscess lies with its fundus against the dura, it is possible, as Koerner claims he first showed, to unite the emptying of the abscess with the removal of the diseased bone in the subjacent region. In this way, he says, Macewen has since operated. The latter has exposed the base of the temporal lobe by removing the upper wall of the auditory canal and the tegmen tympani, and by that channel has emptied the abscess. In order to be sure of removing all necrotic brain-tissue he makes a counter-opening in the squama close above the posterior wall of the auditory canal. Von Bergmann has recently adopted these procedures, and he also, after partial removal of the auricle and turning

it downward, opens the middle fossa of the skull immediately over the bony auditory canal, pushes the dura upward, and reaches easily in this way the tegmen tympani. He can then empty through the middle fossa of the skull the abscess in the temporal lobe, and through the same space by chiselling outward and downward he can remove the primary centres of disease in the temporal bone.

The new method of exposing intracranial diseases of otitic origin, by following in operating the path by which the infection has passed to the brain, enables the surgeon, when cleaning out the primary focus of disease in the middle ear, to expose the point through which the inflammation in the bone of these parts has invaded the cranial cavity. He can thus demonstrate the presence of intracranial inflammations and render them innocuous before they have induced threatening and unfavorable symptoms.

Universal harmony of opinion reigns regarding the manner and principle of operating in otitic brain-abscesses, but the views respecting after-treatment are very diverse.

Macewen has drained brain-abscesses by means of absorbable drainage-tubes, permitting healing to take place beneath one dressing. Others pack the cavity loosely. Eulenstein has found that tight tamponing may cause fresh brain-symptoms. In sinuous cavities careful irrigation under artificial light is necessary, in order to prevent retention of pus, etc. Retentions often appear to be confounded with "second" abscesses; at least in autopsies on those who have been operated upon a "second" abscess is often found very near the first, while in those who have died without an operation, as a rule, *only one abscess* is discovered. "The search after and evacuation of otitic brain-abscesses by the same route through which pus from the diseased ear or temporal bone forced its way to the brain-substance" are the valuable result of the united efforts of general and aural surgeons.

JANSEN, of Berlin, based his report on the experiences gained in the Berlin ear-clinic. During the last few years, when he excepts cases of meningitis, he has found in 148 intracranial suppurations, 108 extradural abscesses, 35 cases of thrombosis of the lateral sinus, and 5 cases of abscess of the brain. 96 times the suppurations lay in the posterior fossa of the skull, 38 times in the middle fossa, and 14 times both fossæ were invaded. The clinic-books show 58 cases of sinus-thrombosis and 16 cases of otitic brain-abscess: 9 times in the cerebellum and 7 times in the temporal lobe.

Opening the cranial fossa has been performed, always in connection with chiselling open the mastoid cavity for the purpose of exposing perisinuous abscesses. In some instances this end has been obtained by opening the middle cranial fossa according to the suggestion of v. Bergmann described above. In many cases, viz., in those in which the mastoid abscess and the pus-focus in the sinus formed one cavity, this has been opened without further operation. When such has not been the form of the abscess the following method has been adopted: After opening the mastoid and the antrum, the posterior wall of the mastoid cavity has been chiselled away until the anterior lateral wall of the sinus has appeared. Exposure of the sinus must be carried forward until healthy tissue is reached; of course, within limits allowed by the topographical relations. Deep-lying suppurations in the cranial cavity are reached only after removal of the posterior wall of the mastoid portion in its

entirety, best accomplished, in Jansen's opinion, with long-bladed bone-forceps and very narrow chisels. If the abscess extends as far as the jugular foramen, it must be exposed by chiselling away the transverse sinus, and, when necessary, by removal of part of the floor of the posterior cranial fossa. If the part of the sinus-wall first exposed is free from disease, then the posterior cranial fossa must be opened far enough to permit of lifting by means of a raspatorium the sinus and the dura from the posterior wall of the petrous bone. If no pus is found here, and yet symptoms of purulency in the posterior cranial fossa continue, Jansen thinks it imperative to expose the upper knee of the sigmoid sinus and that part of its posterior horizontal limb which joins it. If pus then gushes from the middle fossa, or if, with continuing symptoms of intracranial suppuration, the posterior fossa is found to be free from pus, the middle fossa must be opened, preferably above the linea temporalis. If the opening of the middle cranial fossa is begun by removing the lower part of the squama, inspection of the entire upper surface of the pyramid is made essentially easier. The initial puncture should be made close above the posterior wall of the auditory canal and the opening reach backward from that point several centimetres, and forward as far as necessary. Bone-forceps are best adapted for this operation. Deep-lying extradural abscesses, which originate chiefly from irruption of pus through the semicircular canal—though sometimes from conveyance of pus along the course of the facial and major superficial petrosal nerves—usually have their centre at the point where the posterior limbs of the vertical half-arches unite, and then burrow along the posterior upper edge of the pyramid, sometimes outwardly and sometimes inwardly. Nearly all cases of this kind, as observed by Jansen, originated in acute otitis media. The upper wall of the pyramid, as far as the superior semicircular canal, the posterior upper edge of the same for the same distance, and also the adjoining posterior wall of the pyramid should be removed with bone-forceps, as far as the labyrinth-core. Furthermore, Jansen holds that in order to insure undisturbed healing and to avoid burrowing of pus along the acoustic nerve, it is best to follow the exposure of deep labyrinth-abscesses with opening upthe vestibule. This can be done best by removal of the posterior half or two-thirds of the upper semicircular canal, from behind and above downward, by means of narrow, straight chisels. If necessary, also the lower semicircular canal may be partly or entirely removed, and the vestibule laid open from behind forward, by removing the posterior half of the horizontal semicircular canal.

In no instance of all the abscesses in the temporal lobe operated upon by Jansen was it possible to find the point of transition of the pus from the temporal bone to the brain, although the abscess was uniformly directly over and close to the tegmen tympani. In all of such abscesses he removes the posterior upper wall of the mastoid cavity as far as the labyrinth, then, leaving the latter intact, he has removed a part of the squama and the tegmen and penetrated as far inward as the mouth of the Eustachian tube and the outer wall of the cochlea. In this way the field of the operation is freely exposed and made to comprise the deepest parts of infection. Von Bergmann's method of opening the middle fossa of the skull can be used with advantage for exposure of the sinus when symptoms of suppuration in the middle cranial fossa are prominent and when subsequently it becomes plain that suppuration

has spread to the sinus. In general the plan presented already for exposing perisinuous abscesses may be pursued for laying bare the sinus. The thrombosed part of the sinus should be opened forward and downward until undiscolored thrombus is reached, even as far as the jugular foramen, if necessary. Backward it is better to proceed a few centimetres further than the thrombus extends. Excision of the outer sinus-wall insures free drainage. When it becomes evident that the septic degeneration in the transverse sinus has not been caused by occlusion with a solid thrombus, Jansen thinks ligation of the jugular is indicated without further investigation of the sinus. This is to be followed by ligation of the facial vein and the jugular cut away as near the base of the skull as possible with a blunt-pointed knife. Of 25 cases of thrombosis of the transverse sinus recently operated upon by Jansen, 11 were cured: 1 after simple emptying of a perisinuous abscess, 8 after opening the thrombosed sinus, and 2 with simultaneous ligation of the jugular. In 5 cases of opening the sinus and in 4 cases of ligation of the jugular death occurred.

In operating upon the so-called labyrinth-abscesses, already referred to, in which the labyrinth is either partly or wholly removed, no disturbances in equilibrium are induced when the labyrinth-contents are already destroyed by suppuration; but if in the operation upon these parts a normal or partly normal labyrinth is invaded, nearly always vertigo, nausea, vomiting, and nystagmus are evoked, as stated by JANSEN in reply to a question from KESSEL, in the discussion which followed the reading of the above report, so that the labyrinth may still be in a measure regarded as the organ of a so-called sixth sense.

OBSTETRICS.

UNDER THE CHARGE OF

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COMPLICATIONS OF LABOR OCCASIONED BY OPERATIONS FOR THE FIXATION OF THE UTERUS.

Attention has recently been called to complications of labor in cases in which the uterus had been suspended by adhesions following abdominal section, or after suture of the uterus to the walls of the vagina. Among the most recent and interesting of these communications is that of GRAEFE (*Monatsschrift für Geburtshülfe und Gynäkologie*, 1895, Band ii. Heft 6). The patient was aged thirty-eight years, and a multipara. She was brought into the clinic because of prolapse of the cord and death of the child *in utero*. Upon examination the uterus was found firmly contracted upon the child, and

danger of rupture of the uterus threatening if attempt at version had been made. The patient had been operated upon for suspension of the uterus following the removal, by the vagina, of a subserous myoma. In view of the condition present, the abdomen was opened and the uterus amputated, the stump being left at the lower end of the wound. The patient died an hour and a half after operation. On post-mortem examination the anterior wall of the uterus above the internal os was found adherent to the vagina. The right broad ligament was very greatly stretched, and contained a rupture which opened the pelvic cavity into the vagina. Through this rent fatal hemorrhage had occurred.

Graefe also reports the case of a patient, a multipara, in whom a dislocation of the uterus could not be successfully treated by a pessary. The uterus had been fixed to the vagina in accordance with Mackenrodt's method. The fœtus was in transverse presentation, the wall of the uterus greatly thinned, and the fœtus very plainly to be felt. The condition seemed favorable for a rupture of the uterus; in addition, the patient was seized with eclampsia, and had several convulsions. The abdomen was opened and the child removed; the uterus closed by suture. Both mother and child recovered.

In the *Archives de Tocologie*, 1895, No. 11, GOUBAROFF reports the case of a patient who had been operated upon for retroversion of the uterus by anterior suspension. Her foetus was in transverse presentation, and labor was impossible without assistance. To avoid the danger of rupturing the uterus it was determined to deliver the child by Cæsarean section. On opening the abdomen a band of adhesion was found between the uterus and the inner surface of the anterior abdominal wall. The veins of the broad ligament were very greatly enlarged. The child was readily removed and the uterus closed. Very firm adhesions were found between the uterus and the anterior wall of the abdomen. The operation was successful in saving the lives of mother and child.

In the *Monatsschrift für Geburtshülfe und Gynäkologie*, 1895, Band ii. Heft 5, MACKENRODT discusses the influence which suspension of the uterus has upon labor. He finds that the most firm adhesions develop between the uterus and the wall of the vagina, holding the uterus in a pathological anteflexion. A normal pregnancy and labor are only possible when the adhesions following the operation gradually loosen spontaneously. If this is not the case, abortion will occur, or a critical condition develop during labor, threatening rupture of the uterus, with loss of mother and child. Should pregnancy and labor be successfully endured, it is very probable that the retroflexion would again develop. In cases where the uterus has been brought by operation into marked anteflexion, the tubes are usually forced downward and backward, and, becoming pathologically adherent, conception is less likely. It is a better operation to suspend the uterus by ventro-fixation than by vaginal fixation, because it is possible for the adhesions to loosen spontaneously more easily, and danger of hemorrhage and sepsis is less. These remarks apply especially to vaginal fixation of the uterus through the fundus.

When, on the contrary, vaginal fixation is performed through the interior of the uterus, the conditions are more favorable for future conception and normal pregnancy and labor.

Total Extirpation of the Cancerous Uterus at Seven Months' Gestation.

Fehling (*Monatsschrift für Geburtshülfe und Gynäkologie*, 1895, Band ii. Heft 5) describes the case of a patient suffering from cancer of the neck of the uterus seven months advanced in gestation. It was determined to extirpate the uterus, and this was done in the following manner: As it was not deemed safe to delay in the interests of the child, it was not expected that the infant would survive. The abdomen was first opened and the fœtus and placenta extracted. Hemorrhage from the uterus occurred. The broad ligaments were then tied, an elastic ligature placed about the uterus and amputation performed, and the cavity of the cervix seared with a Paquelin cautery. The peritoneal flaps were then closed hastily over the stump. The abdominal incision was then brought together with catgut. The cervix and stump of the uterus were then removed through the vagina. The mother made a good recovery from the operation.

Myoma of the Uterus, with Pregnancy Advanced Five Months; Successful Removal of Tumors and Uterus.

Murdoch Cameron, in the *British Medical Journal*, 1895, No. 1823, describes a successful case of total extirpation of the uterus, pregnant five months, for myomatous tumors, which rendered labor impossible. Upon opening the abdomen a large, irregular tumor was seen, consisting of the uterus and a large fibroid of the interstitial variety. An elastic ligature was first applied, and the uterus and tumors amputated. The uterine and ovarian arteries were then tied, the tubes and ovaries removed, and a myomatous tumor blocking the pelvis was loosened from its adhesions and drawn up. The cervix was also separated from its connections, and the peritoneal flaps were stitched to the mucous membrane of the vagina. These ligatures were left long, and were drawn down into the vagina. The parts removed weighed twenty-seven pounds. The patient made a good recovery.

Intrauterine Fracture of the Tibia, with Congenital Ankle-deformity.

Freiberg reports in the *Annals of Surgery*, 1895, vol. xxii. No. 6, the case of a child who was born with a deformity caused by fracture of the tibia, supposed to have a club-foot from birth. A careful examination, however, showed that an intrauterine fracture of the tibia had occurred. Upon looking into the family history of the child, it was found that abnormalities in the skeleton had been observed in others of the family. Fifty per cent. of reported intrauterine fractures were those of the leg, while but a small number were in the region of the lower epiphysis.

Bleeding from Varicose Veins of the Vagina and Vulva as a Complication of Labor.

Thiele (*Deutsche medicinische Wochenschrift*, 1895, No. 50) reports the case of a multigravida who was seized with hemorrhage from the vagina. On

examination the source of bleeding was found to be varicose veins in this region. The hemorrhage became severe, and was checked with the application of ice and iodoform-gauze tampon. Repeated transfusion of saline solution was also practised. The patient came into labor, and was delivered spontaneously of a dead child. Profuse bleeding from the vagina and urethra occurred. The patient made a slow but uninterrupted recovery.

He also reports the case of a multigravida with valvular heart-lesion, who was taken with severe bleeding from the varicose veins of the labia. While the midwife in attendance was cleansing the patient the left labium ruptured, and profuse hemorrhage followed. The child's head was perforated, and at once extracted during very severe hemorrhage. Bleeding continued until the uterus was completely emptied, The ruptured veins were then closed by suture, and the patient made a prolonged recovery.

PÆDIATRICS.

UNDER THE CHARGE OF

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TRANSMISSION OF SCARLET FEVER BY MEANS OF LETTERS.

GRASSET (*Annales de Hygiène*, 1895, xxxiv. p. 143) records a case illustrating this method of transmitting the contagion. A child visiting away from home was taken ill with scarlet fever, and the desquamation was so marked that the friends wrote home to the parents describing the condition and enclosing several pieces of the skin. Six and a half days after the letter was received a baby-brother fell ill of the same disease. The only other case of the kind reported, according to the author's knowledge, was recorded by Sanné. Two persons received a letter from a scarlatina-convalescent, who stated that she was desquamating so freely that particles of cuticle fell upon the paper as she wrote. Both her friends fell ill of the disease some days later.

INGUINAL HERNIA WITH AN UNUSUAL COMPLICATION.

W. O. ROBERTS, of Louisville (*Archives of Pediatrics*, January, 1896, p. 35), reports a peculiar case occurring in a child one year and three weeks old. from birth there had existed a complete inguinal hernia of the right side, but this had given no annoyance and could always be reduced without difficulty. The day before Dr. Roberts was called in, the child had had what was supposed to be an attack of dysentery, characterized by vomiting, and the

passage of frequent muco-sanguineous discharges from the bowels, with evidence of severe pain. A large tumor occupied the right side of the scrotum, and the mass could not be reduced. Herniotomy was advised as soon as the case was seen by the medical attendant. On cutting down upon the sac the coverings were found to be very thick, and contained little or no fluid. The contents consisted of the appendix vermiformis and a portion of the cæcum. Protruding from the posterior surface of the appendix was an ordinary brass pin, the head being within the viscus and the point sticking out. The appendix was removed, the cæcum returned, and the sac obliterated. The child made an uninterrupted recovery.

"Return-cases" of Scarlet Fever.

It occasionally happens after the discharge of a patient who has been treated for scarlatina in an isolation-hospital that the disease reappears in the family shortly after the convalescent's return to his home. Birdwood, for instance, in the annual report of the Metropolitan Asylums Board, reports from the Northeastern Hospital 61 such cases out of a total of 1793 discharges, a percentage of 3.4. It is quite probable that many of these instances are coincidences, arising in fresh sources of infection; but it is also likely in some cases that infected articles, put away on the removal of the patient to the hospital, are brought out again after his return, and furnish the real source of the new infection. In a certain proportion of cases, however, the lately returned patient certainly is the carrier of the disease.

A careful investigation of the conditions under which these "return-cases" may appear has been lately made by Chalmers (*Lancet*, June 22, 1895) from the statistics of the three fever-hospitals of Glasgow. During 1894, 2593 patients were sent to their homes after an attack of scarlet fever, and in 70 of the houses fresh cases of the disease appeared. In 93 per cent. of these cases the new infection appeared within two weeks after the return. In 19 per cent. the secondary illness seemed to depend upon the recurrence of desquamation or of discharge from the nose or ear in the original patient. In the remaining cases no such cause was found, so that it seems probable that the patient may remain infective, although he is entirely free from desquamation and shows no trace of the disease. There appears to be some evidence of the connection of this latent infectivity with the amount of air-space allotted to each patient in the ward, there being apparently a greater tendency to the communication of secondary infection when the original patient has been treated in an overcrowded ward. Whether this infective power lies in the breath or in the skin, the practical conclusion is adduced that a patient should be isolated from other children for some time after his return from the hospital.

Study of Twelve Epidemics of Varicella.

Semtschenko (*Ejenedelnik*, 1895, No. 28, p. 421, abstracted in *Revue Mensuelle des Maladies de l'Enfance*, December, 1895, p. 582) publishes a study of 872 cases of varicella observed in various epidemics during fifteen years at the Hospice des Enfants-Assistés in Kasan.

In all the cases the existence of a period of incubation was observed, which

lasted three days in 5 children, eight days in 7, eleven days in 26, twelve days in 82, thirteen days in 111, fourteen days in 116, fifteen days in 158, sixteen days in 162, seventeen days in 146, eighteen days in 43, nineteen days in 28, twenty-one days in 11, twenty-four days in 6, and twenty-six days in 2.

The period of incubation passed ordinarily without symptoms, though in a certain number of cases failure of appetite, troubled sleep, or bad humor could be noted, with thirst, pulse-frequency, and slight elevation of temperature. All these symptoms increased in intensity about the time of eruption, which appeared usually simultaneously in several regions. Fever varied with the intensity of the eruption and the gravity of the infection, lasting twenty-four hours in 178 cases, two to three days in 481, four days in 109, and five to six days in 15. The highest elevation of temperature was ordinarily on the evening of the second day after eruption. The number of vesicles varied from 20 to 1000; desiccation of the vesicles of each crop required twelve to fifteen hours—sometimes twenty-four to forty-eight hours.

Second attacks were observed very rarely. In 14 cases the interval was eight to eighteen months; in 5 other cases there were two subsequent attacks of the disease. In some cases varicella appeared simultaneously with other infectious diseases, in such combinations as the following: Varicella, measles, and pertussis; varicella and measles (5 cases); varicella and pertussis (3 cases); and varicella and scarlatina.

Among the complications the most frequent was furunculosis; next in order was submaxillary and cervical adenopathy (27 cases); alone or combined with inguinal adenopathy (5 cases), suppuration of glands being noted twice. Other complications were: Erysipelas (15 cases); osteitis (34 cases), sometimes associated with synovitis (4 cases); and otitis media (17 cases). Nephritis was noted in 5 cases, 3 of which terminated in death from uræmia. Albuminuria, sought for in 251 cases, was found in 42.

Pseudo-membranous Rhinitis and the Bacillus of Loeffler.

Gerber and Podack (*Deutsches Archiv f. klinische Medicin*, 1895, Bd. liv. p. 262) have collected five cases of fibrinous rhinitis in which the bacteriological examination, completed by inoculations of guinea-pigs, has shown the presence of virulent diphtheria-bacilli. From one case—the only one in which the patient was an adult—diphtheritic angina was contracted by a daughter. At this period the father's throat contained virulent bacilli, but the nose showed only the "pseudo-bacillus." This infection occurred upon the seventy-sixth day after the beginning of his rhinitis. In two other cases the "pseudo-bacillus" replaced the true germ on the forty-fifth and eighty-third day respectively after the beginning of the rhinitis. In a sixth case, one of atrophic rhinitis of twelve years' standing, which the authors think may have begun as a fibrinous rhinitis, the "pseudo-bacillus" alone was found.

The relatively benign evolution of primary pseudo-membranous rhinitis is explained by the anatomical peculiarities of the soil in which the bacilli become implanted, and has an analogue in diphtheritic conjunctivitis, the course of which, as far as constitutional symptoms are concerned, is equally benign. The later appearance of the "pseudo-bacillus" and the disappearance

of the true germ is a fact not infrequently observed in the convalescence from the ordinary faucial diphtheria. In those cases where the "pseudo-bacillus" or streptococci and staphylococci are found the authors believe that we must admit the previous existence of virulent bacilli, which, after a certain time, have been replaced by the micro-organisms found later. While the authors raise the question of the identity of the Klebs-Loeffler bacillus and the so-called "pseudo-bacillus," they hesitate to express an opinion on account of the small number of their observations.

In this connection the view of Abbott (*Medical News*, May 13, 1893) seems most rational. He believes "that the Klebs-Loeffler bacillus is in varying degrees of virulence and even devoid of virulence entirely, and that all bacilli that possess the morphological and cultural peculiarities of the diphtheria-bacillus should be considered as such, irrespective of their pathogenic power. The name pseudo-diphtheritic should be applied only to that organism or group of organisms (for there are probably several) that are enough like the diphtheria-bacillus to attract attention, but are distinguishable from it by certain morphological and cultural peculiarities, aside from the question of virulence."

It certainly seems gratuitous to assume an actual substitution of a distinct and unrelated organism of non-virulent nature in place of the previously existing diphtheria-bacillus. Belfonti (*Riforma Med.*, March 23, 1894, abstracted in AMERICAN JOURNAL OF THE MEDICAL SCIENCES, July, 1894, p. 117) has observed a case in which the bacillus was found in extremely virulent activity in the throat of a child seven months after recovery from the disease, and at a time when he had communicated the disease to a sister, with a fatal result. A second examination three months later showed the bacillus still present, but in a state of great attenuation, giving rise to only a slight local inflammation after inoculation. Ravenel (*Medical News*, May 18 and 25, 1895) has recorded twelve cases of pseudo-membranous rhinitis, in every one of which he believes he had to deal with the true Klebs-Loeffler bacillus, which, however, exhibited varying degrees of virulence. His view of the identity of the two forms agrees with that expressed by Abbott.

The subject is one of great interest and of extreme practical importance, and presents a field for further profitable study.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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FAILURE OF COMPENSATION IN VALVULAR DISEASE OF THE HEART.

Not a little difficulty has attended the satisfactory explanation of the cardiac dilatation so constantly met with in the later stages of valvular disease of the heart. Why should the initial hypertrophy, so effective in most

cases in compensating the valvular defect, at last give place to dilatation of the heart-cavities?

So far as the aortic valves are concerned, it would appear from the researches of Martin, Huchard, Weigert, Ziegler, and others that the change from a condition of hypertrophy to one of dilatation is coincident with involvement of the coronary arteries in the process of sclerosis and atheroma of the root of the aorta so constantly met with in aortic valvular disease. The blood-carrying power of the coronary arteries being thus impaired, there result changes in the cardiac muscle (increase of interstitial connective tissue and degeneration of the muscle-cells), in consequence of which its contractile power is lowered and dilatation ensues.

In disease of the mitral valve, however, the conditions are different, yet the most pronounced dilatation is often associated with that lesion. In the hope of finding some structural change in the heart-muscle which would suggest an explanation of this dilatation, BANTI (*Centralblatt f. Allgemeine Pathologie u. Pathologische Anatomie*, 1895, vi. Nos. 14, 15) has examined a number of hearts in various conditions of valvular disease, as the result of which he has been led to conclude that the conditions leading to cardiac dilatation in mitral disease are substantially the same as those which induce it in aortic lesions.

Hearts from three sets of cases were examined, representing different stages in the course of the disease. The first of these were patients in whom compensation was good, death having resulted from some intercurrent disease. In these, simple hypertrophy of the heart was found, without discoverable lesion in the muscular tissue.

The second class of cases comprised patients who were beginning to evince signs of failure of compensation in occasional attacks of cardiac failure, which were, however, as a rule, slight, and quickly responded to treatment. In these cases death resulted frequently from embolism or other complications. Here examination of the heart revealed great dilatation of the coronary veins, extending to their remotest ramifications within the heart-muscle. The intermuscular connective tissue appeared swollen, many of its cells being in a condition of parenchymatous degeneration. The muscle-cells were in places undergoing degeneration, as was shown by vacuolation of their protoplasm. In a few of these cases there was distinct increase in the connective tissue immediately surrounding the dilated veins, a kind of phlebosclerosis, which was usually accompanied by slight fatty pegeneration of the muscle-cells in the immediate neighborhood.

In cases of more advanced cardiac disease, in which death was directly traceable to the condition of the heart, and in which dilatation was pronounced, the changes just described were found to be much more marked. Dilatation of the venous channels was excessive, their walls were greatly thickened, and there was great increase of the intermuscular connective tissue in their neighborhood, the newly formed connective tissue extending outward from them in all directions into the muscle-tissue. The muscle-cells could be seen in various stages of degeneration—atrophied, vacuolated, and more rarely fatty.

The distribution of these lesions in the heart-wall was not, as a rule, uniform. They were usually much more marked in the ventricular walls than

in the septum or auricles, and were by no means equally extensive in all cases.

The changes in the myocardium underlying dilatation and cardiac failure are, then, substantially alike in both aortic and mitral disease. In both they consist in connective-tissue growth and degeneration of the muscle-tissue consequent on impairment of the circulation in the heart-wall, in the one case resulting from disease of the coronary arteries, in the other from long-continued and excessive congestion of the coronary veins.

As accounting for the relatively early appearance of cardiac dilatation in mitral disease, Banti lays much stress upon the inherent weakness of the right side of the heart, which renders it less able to adjust itself to the increased strain thrown upon it than is the more powerful left ventricle.

The Preservation of Organized Urinary Sediments.

It is often very desirable for purposes of instruction or demonstration and for comparison at different times in the course of a case of nephritis to be able to preserve any organized sediment which may be present in the urine.

This, according to Fischel (*Prager medicinische Wochenschrift*, 1895, No. 12), may be accomplished by washing the sediment two or three times with normal salt-solution, best with the aid of the centrifugal machine, and preserving it in equal parts of glycerin and water to which a little (about 2 per cent.) saturated alcoholic solution of thymol has been added.

Sediments treated in this way preserve their structural characters indefinitely and may at any time be mounted for study with the microscope by simply placing a drop of the mixture on a slide, covering it, and preventing evaporation by a ring of varnish.

The Elimination of Uric Acid and Xanthin-derivatives by the Alimentary Canal.

So much stress having lately been laid upon increase of uric acid in the urine as an indication of various disorders of nutrition, it is of interest to know that the occurrence of uric acid and certain xanthin-bases as normal excretions of the alimentary mucous membrane has been shown by Weintraud (*Centralblatt für innere Medicin*, 1895, No. 18).

In a case of leukæmia in which there was a very great increase in the leucocytes, but only slight increase in the uric-acid excretion by the urine, a considerable amount of substance responding to the tests for the xanthin-group of bodies was discovered in the feces, amounting in terms of hypoxanthin to about one gram for the twenty-four hours.

On investigation a variable quantity of these bodies was found to be a constant ingredient of the feces. Their presence was, furthermore, determined to be quite independent of the character of the food. They were still present during a strictly milk-diet, although the decomposition of the nucleo-albumins of milk does not yield any of the the-xanthin-group; and also when a non-nitrogenous diet was taken. They were detected in the accumulated meconium in a case of *atresia ani*. Nor was their quantity greatly increased by a diet rich in nucleo-albumins, as was shown by examinations made after the ingestion of considerable quantities of calf's thymus.

The only inference from this would seem to be that xanthin-bodies are normally excreted by the mucous membrane of the intestine, and this fact must hereafter be considered in the study of the excreta in nutritional disorders.

Quantitative Estimation of Sugar in Urine.

The methods of quantitative sugar-determination in urine which have heretofore been proposed have either been so crude as to lack all diagnostic value or have been too elaborate for ordinary clinical purposes, requiring, as a rule, special laboratory appliances. There has been no test for sugar, which, similar to Esbach's albumin-test, was simple of performance and yet of sufficient accuracy to meet the requirements of the clinician.

Such a test has, however, been recently suggested by Paulus in the *Korrespondenzblatt für schweizer Aerzte* (1895, No. 16). Its basis is the ordinary Fehling test.

As is well known, the copper of each cubic centimetre of the standard Fehling solution (containing 0.03464 gram of cupric sulphate) is reduced by 5 milligrams of glucose. If, then, all the cupric sulphate of one cubic centimetre of Fehling's solution is reduced by a certain quantity of urine, that urine must have contained an amount of reducing-substance equivalent to 5 milligrams of glucose, and the calculation of the percentage of sugar-content is easy; but as ordinarily employed this test requires the use of a burette, of pipettes, and of beakers, and is in so far inapplicable at the bedside. For Paulus's test only a medicine-dropper is necessary in addition to a test-tube and freshly prepared Fehling solution.

By means of the dropper 2 cubic centimetres (40 drops) of the Fehling solution are measured out into the test-tube, are diluted by the addition of about 20 c.cm. of water, and boiled. This quantity of the copper solution requires one centigram of sugar for its reduction. Urine is then added drop by drop, the heating being continued, until the blue of the Fehling solution has changed to a yellow, when the number of drops of urine added should be noted. Twenty, the number of drops to the cubic centimetre, divided by the number of drops of urine added, gives the approximate percentage of sugar, since that many drops of urine contain one centigram of sugar.

It is maintained by Paulus that this test is sufficiently accurate to fulfil most clinical requirements and so simple as to be readily applicable at the bedside.

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